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ABSTRACT

The study estimated per pupil expenditures for a stratified random sample of 571 special education students in three metropolitan school districts--Charlotte-Mecklenburg (North Carolina), Milwaukee (Wisconsin), and Rochester (New York). The study used data collected in 1982-83 from parent interviews, teacher interviews, and the student's school record. The distribution of estimated per pupil expenditures was examined overall and by primary handicap, by placement, by study site, and by background characteristics. Factors associated with variations in estimated per pupil expenditures were identified. Main findings included: (1) the mean per pupil expenditure for all special education students was approximately twice that of regular students; (2) instruction accounted for 68% of expenditures, related services for 8%, and indirect services for 24%; (3) expenditures for instruction and related services varied considerably; (4) hearing impaired and physically/multiply handicapped students had higher per pupil expenditures than other groups; (5) within primary handicap groups there was considerable variation in per pupil expenditures for related services; (6) the least restrictive environment was also the least expensive and special classes were the most expensive placement; (7) there was no evidence of bias based on race, socioeconomic status, or gender in the levels of resources provided for instruction. (DB)

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Per Pupil Expenditures for Special Education: To Whom are Limited Resources Provided?

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EXECUTIVE SUMMARY

We estimated individual per pupil expenditures for a stratified random sample of 571 special education students in three metropolitan school districts using data collected in 1982-83 from parent interviews, teacher interviews, and an abstraction of the student's school record. We examined the distribution of estimated per pupil expenditures, estimated per pupil expenditures for , and estimated per pupil expenditures for , overall and by primary handicap, placement, study site, and background characteristics. Controlling for functional status levels, as assessed by seven measures we developed, we determined which factors were associated with variations in estimated per pupil expenditures. The main findings are summarized as follows.

- The mean total per pupil expenditure for all special education students estimated from our sample was $7,577. This amount was approximately twice as large as our estimate for regular education students.

- Total per pupil expenditures can be separated into three components: instruction, related services, and indirect services. For special education students, instruction accounted for 68% of estimated total per pupil expenditure, related services for 8% and indirect services for the remaining 24%.

- Expenditures for instruction and related services varied considerably across children, even within primary handicap and placement groups.

- Although students classified as hearing impaired and physically/multiply handicapped (4.5% of the study site population) had estimated per pupil expenditures well above the mean for all special education students, their estimated percent of the total pool spent on special education students was still only 6.4%.

- The types of related services provided differed by primary handicap: most speech impaired students received speech therapy, many physically handicapped students received physical therapy, and so on. Within primary handicap groups, although there was considerable variation in estimated per pupil expenditures for related services, there was no evidence that this variation was

associated with placement, functional status, background characteristics or study site differences.

- The least restrictive environment was the least expensive one. The estimated mean total per pupil expenditure, when controlling for primary handicap, study site and functional status, was: lowest for students in all regular classes ($3,847); higher for students based in a regular class with some pullout for special instruction ($5,229); and highest for students based in a special class in a regular school, with or without pullout to a regular class ($8,649 and $8,695, respectively).

- No evidence was found of bias based on race, socioeconomic status, or gender in the levels of resources provided for instruction. For example, the estimated mean per pupil expenditures for instruction and for related services for black students were not significantly different from those for their white peers. After controlling for primary handicap, functional status, placement and school district, no evidence of bias was found in the levels of resources provided for related services.

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SECTION 1 -- INTRODUCTION

In 1977 the Education for All Handicapped Children Act (P.L. 94-142) was implemented nationally, requiring public schools to institute a variety of new procedures with respect to the identification, evaluation, classroom placement, and curriculum for all students with physical, educational, developmental or emotional disabilities. The law was intended to assure every handicapped child a "free appropriate education" in the least restrictive environment consistent with his or her needs. The public schools were to provide instructional services tailored to the learning capabilities of each youngster regardless of the severity of his or her disability and to provide any "related services" deemed prerequisite to participation in school. Between 1977 and 1986, the total number of children receiving special education grew by 16% to over 4.4 million nationwide, or 11 percent of the elementary and secondary school population, including a large number of children with conditions so severe that they previously would have been educated at home or in institutional settings rather than in public schools (Office of Special Education, 1987) .

With the passage of P.L. 94-142, school systems were required to conduct an individual educational program (IEP) evaluation for every special needs child. A written plan was to be produced specifying the child's current performance in school, the recommended educational plan for the child, and a timetable for implementing the plan. The IEP was to include a case conference with the child's parents, attended by a team of school personnel, including the child's teacher. One of the results of this mandate was to be that children would receive

educational services related to their individual conditions and needs, rather than being treated as a group based on whatever label(s) were assigned them.

The expense of fulfilling this broad mandate of P.L. 94-142 has been of great concern to policy makers, school administrators and the tax-paying public (Weiner, 1985; Chambers & Hartman, 1983). To be eligible for federal reimbursement for special education services, states and school systems must comply with all the provisions of P.L. 94-142. The expense of implementing those provisions has been considerable and the federal government has not followed through on its initial commitment of assistance. Although educators were led to believe that, by 1982, the federal government would reimburse the state governments and local districts for 40% of the excess per pupil costs for special education, in fact, the reimbursement rate has been approximately 12 percent (Weiner, 1985). Thus, states and school districts have been left responsible for finding the monies to serve these children.

With the increase in the number of children receiving special education and the lower-than-expected amount of federal aid, local concern over special education costs has been mounting. Many educators and citizens have worried that scarce education dollars, at the federal, state and district levels, are being directed away from other education programs in order to provide services mandated by P.L. 94-142 (Pittenger & Kuriloff, 1982). Further, little is known about how these dollars are distributed within the special education population. To whom are these limited resources provided?

Several studies have been conducted, both prior to and following the implementation of P.L. 94-142, which have estimated per pupil expenditures for education of handicapped children (Rossmiller, Hale & Frohreich, 1970; Marriner, 1977; Kakalik et al., 1981; Chambers & Hartman, 1983; Decision Resources Corporation, 1985). The methodology used in these studies did not permit an examination of variations and patterns in the allocation of resources to individual children because all have used either aggregate data or "typical" children as the units of analysis.

The design of the Collaborative Study of Children with Special Needs provided an opportunity to examine the distribution of resources because per pupil expenditures for education for handicapped children in kindergarten through sixth grade were estimated by means of a resource allocation model which used individual children as units of analysis. For each child under study, expenditures were estimated using: (1) micro-data collected on the educational and related services actually received by the child; (2) expenses derived from district budgets; and (3) data obtained from Kakalik, Furry, Thomas and Carney (1981). In addition, because the data set includes information about the each child's classification, functional abilities, placement, and background, we can examine which factors are associated with variation in resource allocation.

SECTION 2 -- REVIEW OF RELATED RESEARCH

Several studies conducted during the past decade have examined special education expenditures. The studies have generally taken one of two approaches. The first, usually called the expenditure method, employs a model in which district budgets are analyzed and the expenditures, including appropriate indirect costs, associated with each type of special education program are determined. The total expenditure for each program is then divided by the number of children being served by that program to calculate a per pupil estimate. Rossmiller et al. (1970) and Marriner (1977) used this approach. The greatest limitation of this methodology is that districts rarely budget expenses by program. Furthermore, data from different districts are usually incomparable because they are collected and reported in different ways.

The second approach to full expenditure estimation for the education of handicapped children is a resource allocation method. In a resource allocation model, the components of the educational program for each classification of handicapped children are defined. Cost estimates of each of these services are determined based on the costs of each input. By summing the costs of all the services received by the typical student in each type of special education program, a per pupil cost of education can be determined. While this method may overcome one shortcoming of the expenditure method, the incomparability of districts, it has its own limitations. Most importantly, the collection of accurate data regarding the composition of services, both direct and indirect, which a "typical" child is receiving is difficult and

expensive. The three studies described below were based on a resource allocation methodology.

Kakalik et al. (1981) examined the costs of providing special education in 50 local education agencies (LEAs) during the 1977-78 academic year. Using the "typical" child as the unit of analysis, they found that the total per pupil expenditure for a handicapped child was 2.17 times greater than for a nonhandicapped child. They also found considerable differences in per pupil expenditure by disability classification and school placement.

Decision Resources Corporation (1985) is currently collecting and analyzing data on expenditures for special education from 60 LEAs in 18 states. The model developed by DRC is a comprehensive resource cost model. In addition to estimating per pupil expenditures, this study will identify the sources of funding for various programs. The findings of this study will be reported by disability but not by all categories of placement (special schools will be identified separately). Though variations in per pupil expenditures will be estimated, they will represent variations *between* sites not *within* sites.

Another study presently underway at the University of Minnesota (Bruninks & Lewis, 1986) employs a resource cost model with detailed "individual child" data collected from one suburban school district. Although this methodology permits an examination of variability in estimates of per pupil expenditures, the generalizability of the results is severely limited because the data was collected from just one small suburban school district.

Regardless of the method used, all of the cost studies which have been reported to date have been based either on aggregate data or the

"typical" child as the unit of analysis. Because these efforts have not estimated costs for actual individual children, they have not been able to draw any conclusions about the variability of expenditures across children or the relationships between per pupil expenditure and individual characteristics such as functional status or background.

SECTION 3 -- METHODOLOGY[1]

This study of per pupil expenditures for special education was part of The Collaborative Study of Children with Special Needs. The Collaborative Study, conducted by a multidisciplinary research team from The Children's Hospital -- Boston, was designed to provide information about the educational programs and health-related services received by a stratified random sample elementary school children in special education programs in five large urban school systems. Data was collected during the 1982-83 academic year using a design developed by Collaborative Study staff.

Selection of Study Sites

One study site was selected from each of the five U.S. Census regions -- Northeast, Southeast, North Central, South Central and West. To be eligible for participation a site had to: (1) have a sufficient number of students with more severe but less common handicapping conditions; 2) be diverse with respect to child background characteristics and access to health care; 3) have computerized school records available. To satisfy condition (1), only school systems or consortium districts with a total elementary and secondary school enrollment of at least 25,000 students which were situated in a state with at least 50,000 children receiving special education services were considered. To evaluate condition (2), each candidate school system was asked to provide data on the racial, ethnic, and socioeconomic

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[1] This section is substantially identical to material in a dissertation in progress by Ellen S. Raphael at Harvard University.

composition of their student population and information on the health care resources provided in their community (Butler, Singer, Palfrey & Walker, 1987).

After evaluating the information provided by the candidate school districts along with supplemental information available from the U. S. Census Bureau, ten sites were identified and site visits were conducted. The five sites ultimately selected were Charlotte-Mecklenburg Schools, North Carolina; Houston Independent School District, Texas; Milwaukee Public Schools, Wisconsin; Rochester City School District, New York; and Santa Clara County Office of Education, California. Based on availability of financial information, three of the sites were selected for this study of per pupil expenditures for special education: Charlotte-Mecklenburg; Milwaukee; and Rochester.

Sociodemographic characteristics of the three study sites are presented in Table 3-1. The total number of elementary school students enrolled in 1982-83 varied from nearly 19,000 in Rochester to approximately twice that amount in Charlotte and Milwaukee. The three districts identified differing percentages of their elementary school students as needing special education, ranging from a low of 7.6% in Charlotte, to 10.6% in Milwaukee, to a high of 13.4% in Rochester.

Each site was racially and ethnically diverse: non-whites comprised nearly two-thirds of the elementary school students in Milwaukee and Rochester, and slightly less than half the population in Charlotte. The racial and ethnic composition of the special education population was similar to that of the overall population in both Milwaukee and Rochester; in Charlotte, however, the percent of blacks in special education was about 16 percentage points higher ($p < .001$) than

the percentage of blacks in the population. This phenomenon should be interpreted carefully; it may be the result of white special education students being enrolled in private schools in larger numbers rather than their comprising a smaller proportion of the overall population.

Each site had a substantial low-income population; one-third to one-half of the elementary school students in each district came from a household with a family income below 130% of the poverty line. The percentage of special education students who came from "poor" households was not significantly different from that in the overall population in Charlotte and Milwaukee; in Rochester, however, the percentage of families below 130% of the poverty line was 12 percentage points higher ($p < .05$) among special education students than it was among all public school students. The average household income of families in all three of the study sites was below the national average as presented by the U. S. Bureau of the Census (1982). However, as above, these results may have been a reflection of the distribution of students between public and private schools rather than a reflection of the socioeconomic characteristics of these school districts.

Approximately two-thirds of the special education population in each study site was male; the overrepresentation of boys was found predominantly among students classified as speech impaired, learning disabled, emotionally disturbed or mentally retarded, rather than those classified as hearing impaired, vision impaired or physically/multiply handicapped (Palfrey et al.,1986).

Sample Design

The sample surveyed by The Collaborative Study of Children with Special Needs was selected from the elementary school special education population in each study site by means of a stratified random design. Three strata were established based on the child's primary handicapping condition as determined by the school: speech impairments or learning disabilities; emotional and behavioral problems or mental impairments; and physical, sensory or other health impairments. Stratification was for sampling purposes only, and strata were selected to combine categories of roughly comparable prevalence. This sampling technique was used to ensure that there were sufficient numbers of children with less prevalent handicaps for analysis.

In the three sites examined in this study of per pupil expenditures for special education, an initial sample of 1829 children was selected, divided approximately equally across the three sites and three strata. From this initial sample, 137 (7%) were ineligible to participate because they had moved out of the district, were no longer in special education, were siblings of others in the sample, or had died. Consent was granted for 1249 of the remaining 1792 children (74% of the eligible sample). Record reviews and parent interviews were conducted for this group.

Due to cost constraints, teacher interviews, the primary source of information for this expenditure study, were conducted on a random sub-sample of approximately half of the 1249 children (584 cases). Thirteen of the 584 children were kindergarteners who were not in school for a full day and therefore their records were excluded. The final

sample of 571 children included 218 from Charlotte, 202 from Milwaukee and 151 from Rochester.

A comparison of the 137 ineligible students with the remainder of the initial sample of 1829 revealed that they were more likely to be speech impaired or learning disabled, but they did not differ significantly ($p < .10$) with regard to age, grade, sex, race or ethnicity. A comparison of the refusing cases with the consenting cases and those selected for the teacher interview with those who were not selected revealed no statistically significant differences ($p < .10$) on these same measures.

Measurement

The Collaborative Study was designed to address many issues in the lives of special education students, including their diagnostic and preschool histories, the education and health services they received inside and outside of school, expenditures for these services, parent and teacher perceptions of student progress, and communication patterns between the schools and health professionals. Information was collected during a three month period in the spring of 1983 using data tapes, record reviews and interviews with the child's parent, teacher and physician.

Information about the instructional and related services received by each student, as well as several indicators of functional status, was derived from teacher interviews. For each child for whom a teacher interview was to be conducted, The Collaborative Study was provided, by the child's school district, the name of the teacher with whom the child

the majority of the school week.2 The identified teacher was mailed a description of the information to be requested in the 25 minute interview as well as background information about the Study. The interview was then conducted by telephone by trained personnel from the University of Illinois Survey Research Laboratory.

The teacher interview was designed to collect information about the child's school week, similar to that collected at the program level in a study conducted by Kakalik, Furry, Thomas and Carney (1981). The teacher respondent was first asked a series of questions pertaining to the child's experience in the classroom including the size of the class, how many hours per week the child spent in the classroom, how this time was divided between individual, small group and large group instruction, and the availability and use of paid instructional aides. The teacher was then asked how the child spent the remainder of his or her school week. If the child received any academic instruction, non-academic instruction or related services from school personnel other than the interviewed teacher, the respondent was asked to identify the instruction or service provided, the type of personnel providing the instruction or service, the number of hours per week the child received the instruction or service and the size group in which the instruction or service was provided.

Parents or guardians were also interviewed by telephone for 40 minutes in either English or Spanish by trained personnel from the University of Illinois Research Laboratory. They were asked questions

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2 In a few cases, the teacher identified by the school system, and subsequently interviewed, was not the one with whom the child spent most of his or her school day. The data collected in these teacher interviews may have been less valid and reliable.

about such topics as family composition, household income, mother's education, and the functional status of their child. By comparing the family's income and size to the 1982 poverty line (U.S. Bureau of Census, 1983), the Collaborative Study staff computed a poverty-income ratio. The child's age, race, ethnicity, gender and parent attendance at the most recent IEP conference were collected during a 30 minute review of each child's school records conducted during 1983 by personnel trained and supervised by Collaborative Study staff.

Data on district expenditures and personnel were collected from on-site interviews I conducted in each of the sites as well as a review of published budget information.

Primary Handicap. Each child's primary handicap was obtained from data tapes supplied by the schools. Information about additional handicapping conditions was collected during the teacher and parent interviews and is reflected in the functional status measures described below.

School and Classroom Placement. Two measures of educational placement were developed by The Collaborative Study and are defined in Singer, Butler, Palfrey and Walker (1986) from information collected as part of the teacher interview.

> The first -- percentage of time in regular classes -- was the proportion of the child's school day, exclusive of time receiving related services, spent in regular classes for instruction. Thus, a child who spent 30 hours per week at school, generally in a regular class, but who was removed for 4 hours per week -- 3 hours to a resource room for instruction and 1 hour for speech therapy -- spent 30-1-3/30-1 [sic] or 90% of his time in regular instruction. Similarly, a child who spent 30 hours per week in school, generally in a special class, but who was mainstreamed for 5 hours per week in a regular mathematics class, spent 5/30 or 17% of his time in regular instruction. Second, based on the percentage of time in regular classes, a categorical measure of placement was constructed, composed of five levels: (1) all regular classes, (2) regular class with some special instruction

(not more than 50% of the school day), (3) special class with some regular instruction (not more than 50% of the school day), (4) all special classes, and (5) special school. (p. 323)

Functional Status Measures. Seven functional status measures were developed by the Collaborative Study from information collected as part of the parent and teacher interviews. For each of the measures, better functioning is indicated by a lower score. The construction of these measures is described in Singer, Palfrey, Butler, and Walker (1988) and is summarized as follows:

Speaking level. Parents were asked if the child had "trouble speaking" and, if so, if it "affected the child's ability to do all other things children his/her age can do?" The measure takes on three values: 0 = no trouble; 1 = trouble with no effect; and 2 = trouble with effect.

Academic level. Teachers were asked for the child's grade level (to the nearest month) in reading and mathematics achievement. The measure of academic level is the difference in the child's average reading and math level and his expected grade level given his age.

Social skills. Teachers were asked to answer, using a four-point scale, four questions about the child's social functioning in school. Is the child: (1) left out of free time play activities; or (2) picked on by other students? Does the child: (3) have a behavior problem; or (4) have difficulty getting along with other children or adults? The measure of social skills is the first principal component of these four items, which accounted for 57.8% of the variance [in the five-site sample].

Psychological well-being. Teachers were asked to answer, using a four-point scale, 12 questions about the child's level of anxiety and hostility.... The items included those of the form: How often in the last month has the child...[sic] flared up if he couldn't have his own way; told lies; not responded to discipline; seemed sad; complained about problems; said people didn't care about him; acted afraid or apprehensive, etc.. The measure of psychological well-being is the first principal component of the 12 items which accounted for 48.5% of the variance [in the five-site sample].

Everyday knowledge. Teachers were asked five questions about the child's everyday knowledge. Can he communicate his ...[sic](1) name? (2) address? and (3) telephone number? and, Is he knowledgeable about ...[sic](4) time? and (5) money? A Guttman scale model to fit these five items yielded a coefficient of reproductibility of .95 and a coefficient of scalability of .82

[in the five-site sample]. The measure used is the number of positive responses.

Hearing. Parents were asked if the child had trouble hearing or if he wore a hearing aid. The measure used is a three point [sic] scale: 0 = no trouble hearing; 1 = trouble hearing, no hearing aid; 2 = trouble hearing and uses hearing aid.

Activities of daily living. Parents were asked to rate, using a four-point scale, the child's ability to perform four activities of daily living: (1) feeding; (2) dressing; (3) toileting; and (4) getting around inside and outside. In addition, they were asked (5) whether the child used a mobility aid, and (6) had any of 12 medical problems such as cerebral palsy or muscle disease (converted to a simple count). The measure used is the first principal component of these six variables which accounted for 56.4% of the variance [in the five-site sample]. (pp. 10-11)

Statistical Analysis

Outcome variables. Total per pupil expenditures were divided into three components -- instruction, related services and indirect services. The primary analytic focus was to identify the factors associated with the variation across students in expenditures for instruction because this component of expenditure accounted for an estimated two-thirds of total per pupil expenditure for special needs students.

It was difficult to model estimated per pupil expenditures for related services because the strong relationship between service provision and the child's primary handicap necessitated building the models separately for each primary handicap group. Limited sample sizes precluded the modeling of per pupil expenditures for related services for all primary handicap groups except speech impaired and learning disabled.

Models for per pupil expenditures for indirect services were not estimated because the values for per pupil expenditures for indirect services were calculated primarily on the basis of two of the predictors: primary handicap and placement. As a result, any

relationship which was found would likely have been a function of the method used to determine the expenditure variable.

Analytic Approach. Five sets of predictors were identified which were expected to be associated with the variation in per pupil expenditures: primary handicap, placement, study site, child and family background, and functional status. To explore the relationship between estimated per pupil expenditures for instruction and these five predictor sets, a series of multiple regression models were estimated. Because the data collected by the Collaborative Study was designed as a set of case studies (each study site representing one case), all regression models contained controls for the study sites. The regressions were estimated without an intercept, allowing the coefficient for each study site to be the controlled mean for that study site.

The level of service for each child is established during an individualized educational program (IEP) conference. Based on the information presented at the IEP, two major decisions are made: the child is assigned a primary handicap and placement. In addition, the details of the child's program for instruction and related services are specified. The initial model explored the relationship between primary handicap and per pupil expenditures for instruction, under the premise that children with different primary handicap labels would be allocated different levels of resources. Toward this end, Model I included only study site and primary handicap as predictors. Taken together, these predictors explained 11.6% of the variation in estimated per pupil expenditures for instruction.

The examination of the relationship between primary handicap and functional status indicated that although, on average, the designation of primary handicap was consistent with the child's functional status as measured by the study data, a portion of the child's underlying condition appeared to be captured by the functional status measures independently from primary handicap. In order to investigate this further, Model II (Table 5-9) was estimated with study site, primary handicap and the seven functional status measures as predictors. The amount of explained variation in the model rose to 15.7%.

The next set of regression models investigated the relationship between placement and per pupil expenditures for instruction. In previous analyses of these data (Raphael, Singer, Palfrey & Walker, 1986), the Collaborative Study reported that expenditures were higher in more restrictive settings, but, at the time, we were unable to determine whether this relationship was attributable to placement *per se*, or whether it was an artifact of the (generally lower) functional status of children in these more restrictive settings. To address this concern, the model of the relationship between placement and per pupil expenditures for instruction included controls for both the child's primary handicap and functional status along with study site. Model III in Table 6-7 shows that controlling for functional status and primary handicap, placement is indeed significantly related to per pupil expenditures for instruction; taken together, these three sets of predictors explain 29.2% of the variation in resources for instruction.

Because the data suggested that assignment of primary handicap and placement may have differed systematically by site, several tests were performed to determine whether any interaction between study site and

the other sets of predictors was significant. First, the model was estimated both separately by study site and as a single model with study site control variables included; an F-test showed no significant difference ($p > .05$) between the two specifications. Moreover, tests of interactions in the single model (Model III) between study site and functional status, primary handicap and placement revealed no significant effects ($p > .05$).

The final set of regression models examined whether variation in per pupil expenditures for instruction was related to child and family background characteristics (gender, race, family income relative to the poverty line, mother's education, and parent attendance at the most recent IEP conference). Model IV in Table 7-4 shows that, controlling for study site, primary handicap, placement and functional status, no bias in the allocation of resources for instruction was found. The complete set of predictors explained 33.6% of the variation in per pupil expenditures for instruction.

Sampling weights. The estimated means, standard deviations, 10th and 90th percentiles presented in this paper are based on a weighting procedure which adjusts statistically for the stratified sampling design. First, weights were assigned to each case to produce site estimates which were reflective of the population of that study site by compensating for those low-prevalence handicap groups which were oversampled. The weights were then adjusted for the sample sizes in each study site so that overall estimates did not overemphasize the results in any one study site. The sample sizes which are reported in the findings are the actual number of students studied.

The regression models were not estimated using these sampling weights because the child's primary handicap and study site (the sampling strata) were included as predictors in all of the regression models (DuMouchel & Duncan, 1983). Weighting the regression models would have overemphasized the results for the high-prevalence groups and underemphasized the results for the low-prevalence groups.

Constraints on Inference

Error in Measurement in the Data. To perform an expenditure analysis with the individual child as the unit of analysis, we ideally would have gathered precise information from the teacher about how the child spent every minute of a particular day or week. Because of the limitations of memory, time, and information, as well as the natural variations from day to day and week to week, each teacher had to make some judgements about what to report about the student's experience, both inside and outside the teacher's classroom. Although this may lead to some error in measurement, we do not believe it should produce any systematic bias.

Left-Out Variable Error. Of the five sets of predictors in the regression models -- study site, primary handicap, placement, child and family background, and functional status -- the first four could be measured with a high degree of precision; they are considered *observed* characteristics. The last predictor, functional status, is a combination of *observed* and *unobserved* characteristics. The seven measures of functional status developed by the collaborative Study reflect the observed portion of the child's underlying condition which was possible to measure from the data. There is also an *unobserved*

portion of functional status that can not be specified in the model. Because functional status is related to primary handicap and placement, it is likely that "leaving out" the unspecified component of functional status from the model is introducing bias into the coefficients for primary handicap and placement. Therefore, the true estimates of the effects of primary handicap and placement may differ in magnitude and significance from those reported here. Although techniques exist which permit the computation of the bounds of that bias (Leonard, 1979; Klepper & Leamer, 1984), such analysis is beyond the scope of this study.

Study Design. As previously stated, The Collaborative Study was designed as a set of case studies, each employing the same methodology. This case study design makes it possible to pool the data when the differences *between* study sites does not overpower the results of the pooling. In addition, the research design allows for comparisons from study site to study site (Greene & David, 1984; Kish, 1987).

Generalizability of Results. Although each of the three district samples was a stratified probability sample of that district, their combined results cannot be expected to generalize to all school districts across the country. In particular, the focus on major metropolitan areas means that, at best, the findings may be reflective of urban experience, but not small-city or rural experience. Furthermore, the findings with respect to placement may not be applicable to smaller school systems whose range of placement alternatives is more limited than those in this study.

Placement Specification. In Singer et al. (1986), one additional caveat surrounding the definition of placement is offered:

> [The types of supplemental instruction used to define classroom placement included] only academic instruction by someone other than the child's usual teacher.... This approach excluded other specialized or mainstream experiences, including (a) regular instruction for nonacademic subjects such as music, art and gym, (b) specialized instruction in the child's usual class through small group or individualized instruction, (c) specialized services such as speech therapy, occupational and physical therapy, and counseling, (d) specialized instruction in gym such as adaptive physical education, and (e) the availability of a resource teacher who provided specialized materials for the child's usual teacher. Because of these limitations, it is best to consider our measure of educational placement as indicative of academic instructional placement and not necessarily as a full view of the child's regular and special experiences in school. (p. 324)

Although the specification of placement does not contain the effects listed above, many of these placement-related aspects of education are explored in the sections which follow.

Functional Status Measures. The limitations of the functional status measures is described in Singer et al. (1988).

> The items comprising the seven measures of functional status were adapted from standardized questionnaires, but they do not have the well-established psychometric properties associated with individualized assessment instruments. [Furthermore,]...the study lacks a standardized measure of "intelligence." ... When we do not find differences in functional status across primary handicap groups, [placements] and school districts, it may well be due to the measures used in the study, not a lack of differences between the groups. (p. 13)

Statistical Power. The statistical power within any single handicap or placement group is somewhat limited, but is greatly increased when there is a consistent pattern of findings across groups. Thus, in interpreting the results, attention should be focused on consistent patterns, not isolated significant or non-significant coefficients.

The Expenditure Model

The expenditure model presented in Table 3-2 estimates the expenditures for education for each child in the Collaborative Study using information from the teacher interview and record review as well as district financial data. It does not estimate the excess expenditures for special education beyond the regular education program; rather expenditure estimates include all expenditures on the education of each student, with the exception of capital expenditures, transportation, and health services costs.

Financial information was obtained from published district budgets, printouts of actual salary information, and on-site interviews with budget and special education personnel. When average salaries from several sources conflicted, this analysis relied first on printouts of actual salaries, next on published district budgets and lastly on figures provided by the districts without supporting detail. All salary information was adjusted to include fringe benefits particular to each site.

Two sets of expenditure estimates were computed: one using district pricing for inputs and one using uniform pricing (an average of the three districts) for inputs. The estimates reported in the sections which follow, unless otherwise noted, represent those computed using uniform pricing. Comparisons across districts therefore control for variations in prices and represent only variations in resources. In Section 4, per pupil expenditures computed using district pricing are compare to those computed using uniform pricing.

Instructional expenditures were estimated by analyzing the data from the teacher interview describing how much time the student spent

per week in large groups (6 or more children), small groups (2 - 5 children) and one-to-one instruction with their primary classroom teacher, classroom aides and other instructional personnel. Salary information for each category of personnel was matched with the corresponding time estimate to derive a figure for annual per pupil expenditures for instruction.

The expenditure estimates for related services relied on information from the teacher interview describing the type of services received, number of hours each week spent receiving the service, type of personnel providing the service and size of group (large, small, or one-to-one) in which the service was provided. Related services included speech therapy, physical and occupational therapy, child or family counseling, audiology, and any others reported. The district average salary for the type of personnel providing each service was matched with the study data and a sum was taken across all services provided for each student to estimate the expenses for related services. The information was then broken out by related service type in Table 58.

Although special transportation often is regarded as a related service, it was not estimated for this analysis. Accurate district data was not available on expenses for transportation separately by special and regular education students. Estimates presented by Kakalik et al. (1981) for transportation expenses by primary handicap and placement were unstable. Therefore, rather than use inaccurate or unstable estimates, expenditures for transportation were omitted. Although this item is a sizeable one in the expenditures for education for physically/multiply handicapped students and for others who require special transportation, it is also strongly related to a child's

proximity to school and size of school district. Including it in the model could have had the effect of introducing noise into the estimates, particularly with inaccurate data.

Indirect expenditure estimates were calculated on a site-by-site basis for the various placement and disability categories. As indicated in Table 3-2, indirect cost was composed of the following components: general school administration, both district and school levels; special education administration; instructional equipment and supplies; screening, assessment, admission and IEP conferences; food services; and building maintenance and operations.

Estimates for food services and building maintenance and operations were taken directly from the 1982-83 district budgets. Expenditures in each of these categories were divided by total enrollment to determine a per pupil expense.

Although expenditures for food services may not vary from student to student, it can be argued that based on placement and disability, students "occupy" differing proportions of space in the building and therefore have differing amounts of money expended on them for building maintenance and operations. Due to the unavailability of accurate information on the school building square footage "occupied" by each student in the study, those expenses were divided evenly across all children.

Expenses for general administration were derived from estimates published in the Kakalik et al. (1981) by using salary indices to adjust the 1977-78 national estimates to site-specific estimates in 1982-83 dollars. The estimates by disability and placement for special education administration, instructional supplies and equipment,

screening, assessment, admission and IEP conferences and transportation in Kakalik et al. (1981) were similarly adjusted and included in the model. Because expenditures for these indirect costs were derived in a site-specific manner, the within-site standard errors of these estimates were low.

Educational expenditure studies have often left out capital expenditures. Valuing the capital stock in a school district and allocating the capital costs across students over time is a complex matter. The differences in the ways the three sites in this study accounted for capital expenditures made it impossible to develop a measure that would have been comparable across sites. Although these capital expenditures would have affected the magnitude of the expenditure estimates, they would not have altered the relationship between the estimates for the various disabilities or placements within sites. Thus the model focused on expenditures for direct services and most of those for indirect services.

SECTION 4 -- STUDY SITE AND PER PUPIL EXPENDITURE FOR SPECIAL EDUCATION[1]

It is well known that per pupil expenditures for education vary widely across states and school districts. These variations are caused by: (1) differing mixes of students and their educational needs; (2) differing practices with respect to identification, placement and levels of services provided to students; and (3) differing prices of services from district to district. The figures for per pupil expenditures usually reported to the public do not separate out these components and, therefore, may suggest some misleading conclusions about the levels of commitment made by various districts to special needs students. In the sections which follow, we explore the three components of the variation in per pupil expenditure for special education students by school district for the three sites in this study.

Table 4-1 presents the estimated mean, estimated standard deviation and the range of total per pupil expenditure for special education students overall and by study site. These expenditure estimates were calculated using actual district financial information. Although none of the expenditure estimates is a precise measure of dollars spent (due to measurement error and components which have been left out), they do reflect the district allocation of actual funds among children.

The overall estimated mean total per pupil expenditure for education for a special needs student in 1982-83 was $7,590. There was considerable variation across individual children in the estimated total

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[1] This section is substantially identical to material in a dissertation in progress by Ellen S. Raphael at Harvard University.

expenditure, with 80% of the values falling between approximately $4,000 and $13,000.

This variation across students persisted when the sample was divided by study site.

The estimated mean total per pupil expenditure also varied across school districts. Although the estimates for mean total per pupil expenditures in Milwaukee and Rochester, $8,539 and $8,711 respectively, were not significantly different from one another ($p > .10$), the estimated mean total per pupil expenditure in Charlotte, $5,959 was significantly lower than the other two ($p < .0001$). We have already identified three components of this variation. We can remove the one of these effects by using a uniform pricing scheme and thereby controlling for the variation between districts in input prices for goods and services. To explore the amount of variation between our three districts in input prices, we will examine teacher salaries, the largest factor in computing per pupil expenditures for education.

Table 4-2 presents average teacher salaries, including fringe benefits, nationally and for the three study sites. It is worth noting that overall and by study site, average teacher salaries were lower for special education teachers than for regular education teachers. This was a result of the relative seniority of the two groups, not a differential in salary schedules. In all three districts, special education teachers were paid on the same schedule as regular education teachers (in fact, historically a positive differential was paid to special education teachers).

Teacher salaries varied from district to district, with "prices" for teachers in Charlotte being closest to the national average and

considerably less than the other two districts. This is reflective, in part, of a lower cost of living in Charlotte which results in lower prices for other inputs as well.

The estimates computed using uniform pricing controlled for these district variations in input prices; instead of using a price for each service or salary based on the student's school district, the estimates constructed with uniform pricing all used the same prices for inputs, the average of the three school districts in the study. The estimates constructed with uniform pricing therefore reflect the resources devoted to each child as measured by the level of services that child was receiving, rather than by actual dollars spent by the school district.

Table 4-3 presents estimated means and standard deviations of per pupil expenditures using the two methods of pricing inputs: district pricing (which incorporates district differences in input prices), and uniform pricing (which controls for district differences in input prices). This table contains estimates for total per pupil expenditure and for the three components of total per pupil expenditure: instruction; related services; and indirect services.

We already noted that the mean total per pupil expenditure in Charlotte was considerably lower than those in the other two sites. This distinction between Charlotte and the other two study sites was also reflected in the per pupil expenditure for instruction ($p < .0001$) and for indirect services ($p < .0001$) but disappeared in the per pupil expenditure for related services ($p > .10$).

However, when the estimates were computed with uniform pricing, and the effects of the lower input prices in Charlotte were removed, the relationship between estimated expenditures in Charlotte and the other

two study sites changed. In fact, overall and by component expenditure category, less than 2% of the variation across students in per pupil expenditure computed with uniform pricing was explained by study site differences.

The comparison of the estimated per pupil expenditures computed with uniform pricing between Charlotte and the other two study sites revealed no significant differences ($p > .10$) in service levels for instruction and overall. However, students in Charlotte did have a higher level of resources for related services than students in the other two study sites ($p < .001$). Thus, the differences in the prices of inputs created the impression that students in Charlotte received fewer services than students in Rochester and Milwaukee when, in fact, further analysis revealed that this was not the case. This illustrates the need for careful interpretation of comparisons between school districts of expenditure estimates which are created using district pricing schemes.

Also of note is fact that the estimated per pupil expenditures for indirect services differed slightly in the three study sites, with the estimated mean in Charlotte significantly lower ($p < .05$) than in the other two districts. This component of the total per pupil expenditure was computed largely as a function of assigned primary handicap group and placement. The study site differences in the means of these estimates reflect site variations in the prevalence rates of primary handicap groups assignments and placements. Therefore, caution should be taken in interpreting the differences in mean per pupil expenditures for indirect services by study site without controlling for primary handicap and placement. Primary handicap and placement, and their

relationship to estimated per pupil expenditures, will be explored in Sections 5 and 6, respectively.

Under both pricing schemes, approximately two-thirds of the total spent on the average special education pupil was spent on instruction, one-quarter was spent on indirect services, and the remainder was spent on related services. However, the components of expenditure which were left out of the model, transportation and capital expenditures, would alter these relationships, and should be considered when interpreting the apparent distribution between components of the total.

In order to control for the district differences in the price of inputs, all of the tables which follow use estimates computed with uniform pricing. Therefore, in Sections 5 - 7, any differences detected in expenditure estimates reflect differences in the mix of children and their needs and/or the level of services provided.

SECTION 5 -- PRIMARY HANDICAP AND PER PUPIL EXPENDITURE[1]

Having separated out the variation in per pupil expenditures for special education which can be attributed to differences in the district prices of inputs, we now move to examine the other two sources of variation which we have identified: differences in the mix of students and their educational needs; and differences in the practices of identification, placement and levels of service. There is a good deal of information we know about these two sources of variation from the data. In the IEP conference, an interdisciplinary team from the child's school collects information about the child, designates a diagnosis (the primary handicap), and prescribes a set of services to best meet that child's individual needs. The designation of a primary handicap reflects both the observable indications of the child's underlying condition, based on information collected for the IEP, and the district's standards and conventions for labeling children.

The data also contain an additional independent source of information about the observable indications of the child's underlying condition: the seven functional status measures. These measures were constructed from information collected in the interviews with parents and teachers and are believed to reflect the child's underlying condition, not the child's primary handicap label (Singer et al., 1988, p.23). They add to our knowledge of the "mix of children" in each study site.

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[1] This section is substantially identical to material in a dissertation in progress by Ellen S. Raphael at Harvard University.

However, there is still information missing on the underlying condition of each child, either because we did not capture it with the measures or because it is unobservable. This "missing information," along with the included information on functional status, was most likely one of the factors that influenced classification by primary handicap and placement and, therefore, probably caused bias in the estimates for primary handicap and placement. Although it is beyond the scope of this study to measure that bias, it is important to note that the estimates which follow for primary handicap and placement groupings were most likely confounded by the unobserved underlying conditions of the children.

Furthermore, although primary handicap is an indication of the child's underlying condition, it is also a signal for various educational "treatments." Although there is considerable evidence, in this study and others, that individualization of educational programs does occur based on the child's needs, there also appears to be some standardization of programs for students with a given label. Therefore, primary handicap is both a measure of the "mix of children" and the "practices of identification."

Definition of Primary Handicap

The labels and groupings of children by primary handicap differ somewhat from district to district, however, they typically correspond to those categories identified in P.L. 94-142: speech impaired, learning disabled, emotionally disturbed, mentally retarded, hard of hearing, deaf, visually handicapped, orthopedically impaired, or other health impaired. For the purpose of this study, these handicaps were grouped

into seven categories. Table 5-1 presents the definitions of these handicaps which are specified in the regulations accompanying the Act.

Distribution of Children by Primary Handicap

Table 5-2 presents the distribution of children by primary handicap, nationally, and by study site. The study sites, taken as a group, had about one-quarter more children classified as speech impaired or as emotionally disturbed than the national average and about the one-quarter fewer children classified as learning disabled, as mentally retarded, as vision impaired or as physically/multiply handicapped than the national average. These finding should be interpreted carefully, however, because the study data was collected from an elementary school population and the national data was compiled for a population grades K-12. Because proportionally more younger children than older children are classified as speech impaired, this phenomenon may be a function of simply the age distribution of the groups.

Among the three study sites, Charlotte had the largest percentage ($p < .0001$) of students classified as learning disabled (44.5% versus 31.2% and 33.4%) and the smallest percentage of students classified as emotionally disturbed (5.6% versus 15.7% and 14.0%), hearing impaired (0.9% versus 2.0% and 2.6%) or physically/multiply handicapped (0.9% versus 3.4% and 3.5%). For these four primary handicap groups, no significant differences between Milwaukee and Rochester were found in the percentages of students with each classification ($p < .05$). Overall, the classification distributions in Milwaukee and Rochester were quite similar to one another and slightly different than Charlotte.

Despite the stratified sampling design, only 12 vision impaired were studied. Because of this small sample size, vision impaired children will not be presented separately as a group in subsequent tables. They are, however, included in summary information about the sample overall.

Relationship between Primary Handicap and Functional Status

Examining the relationship between primary handicap and functional status can give us an indication of whether the primary handicap variable is a strong a measure of the child's underlying condition, as observed through the functional status measures. Table 5-3 presents estimated means and standard deviations of the seven functional status measures by primary handicap, for students in all three school districts combined. For each measure, the table also presents the percentage of children with scores above a threshold level which signaled a problem in that domain. In addition, the table contains the estimated mean and standard deviation of the total number of domains in which a child exhibited a problem, by primary handicap. The estimated means of all seven functional status measures as well as the estimated mean number of domains in which a child exhibited a problem differed significantly ($p < .0001$) by primary handicap.

The information presented in Table 5-3 suggests that, on average, the primary handicap label was consistent with information provided by the measures of functional status. For each primary handicap group, the estimated mean functional status scores were generally the highest (worst), relative to other primary handicaps, in the domain(s) in which students with that primary handicap classification would be expected to

have a problem. Students classified as emotionally disturbed had the highest estimated means for social skills and psychological well-being; students classified as mentally retarded had the highest estimated means for academic skills and everyday knowledge; students classified as hearing impaired had the highest estimated mean for hearing; and students classified as physically/multiply handicapped had the highest estimated mean for activities of daily living. Only the classifications of speech impaired and learning disabled did not, on average, have functional status scores which were worse than the other primary handicaps in the expected domains.

The primary handicap label can be an important indicator of problems in one or more principal domain(s); however many special education students have multiple problems, only some of which are reflected by the primary handicap label. Students classified as mentally retarded had the highest estimated mean number of domains in which the child exhibited a problem. These students, on average, had poor academic skills and knowledge of everyday concepts, and, in addition, approximately two-thirds had problems speaking or with activities of daily living. Although students classified as speech impaired were performing at the expected level for their age academically, problems in speaking were supplemented by problems in social skills or psychological well-being for over half the students. Over 75% of the students classified as emotionally disturbed were behind in their academic work as well as having problems with social skills and psychological well-being. Students classified as physically/multiply impaired were not only apt to have problems with activities of daily

living, but were likely to exhibit difficulties in every other functional domain except hearing and social skills.

There is, therefore, strong evidence that primary handicap labels were generally consistent with functional levels. In most cases, a child had problems functioning in the principal domain indicated by the student's primary handicap label. But not all the variation across children in functional status can be captured by primary handicap classification. Even within primary handicap groups, considerable variation existed in the capabilities of individual children, as is indicated by the large estimated standard deviations for each of the functional status measures and the total number of domains affected. Furthermore, in addition to those underlying conditions measured by the functional status variables, there were also those conditions which we could not or did not measure and which may not have been reflected in the assignment of the primary handicap label.

School District Differences in Classification Practices

Although some of the variation between study sites in the distribution between the six disability classifications may have resulted from differences in underlying prevalence rates, a portion of the variation was attributable to differing district classification practices. In a paper produced by the Collaborative Study (Singer et al., 1988), this question is examined fully for the five original study site using discriminant analysis with the following findings:

(1) the mean functional levels of students classified as mentally retarded, physically/multiply handicapped and hearing impaired differed across districts;

(2) districts that classified more students as mentally retarded were serving less impaired students under this label;

> (3) districts were least consistent in their use of mentally retarded and emotionally disturbed designations and most consistent in their use of the hearing impaired and, to a lesser extent, physically/multiply handicapped designations; districts' use of the speech impaired and learning disabled designation fell between these two extremes. (p. 2)

The findings for the three sites in this study are similar to the findings for the five-site sample above. Table 5-4 presents estimated mean functional status levels by study site within each of the six reported handicap groups. The functional status of students classified as mentally retarded, hearing impaired, and physically/multiply handicapped differed significantly by study site.

In Rochester, where the highest percentage of students were classified as mentally retarded, students who were so labeled had consistently better (lower) scores on the functional status measures than their counterparts in the other sites; in the domains of speaking ability and everyday knowledge, these differences were significant ($p < .05$). However, in activities of daily living, students classified as mentally retarded in Rochester were more functionally impaired than their counterparts in the other sites.

For students classified as physically/multiply handicapped, those in Milwaukee had higher (worse) scores on the functional status measures for everyday knowledge and activities of daily living than those in the other two sites. On psychological well-being and hearing ability, however, the site means in Milwaukee were slightly lower (better) than in the other two sites.

For students with hearing impairments, site differences were significant for speaking ability, academic level, and everyday

knowledge. Students classified as hearing impaired in Milwaukee consistently scored higher (worse) than those in the other two sites.

Therefore, there is some evidence to suggest that the use of primary handicap labels, and even the identification of students for special education programs, does differ somewhat from school district to school district. This finding is important because there is anecdotal evidence that the labels, themselves, often contribute to the determination of levels of service for a given child. Further analysis in this study will support this hypothesis.

Total Per Pupil Expenditure by Primary Handicap

There was considerable variation in total per pupil expenditures by primary handicap group. Table 5-5 presents the estimated mean, estimated standard deviation, 10th percentile and 90th percentile of total per pupil expenditures overall for special education students, by primary handicap and for regular education students.

Because no data was collected on regular education students as part of The Collaborative Study, an estimate for the total per pupil expenditure for regular education students was constructed using children classified as speech impaired whose placement was in all regular classes. For these students, we assumed they received no related services and only routine screening without assessment or IEP conferences resulting in an estimated total per pupil expenditure of $4,155.

These findings suggest that, on average, the total per pupil expenditure for a special education student, $7,577, was nearly twice that of a regular education student. Furthermore, almost all special

education students had higher estimated total expenditures than the average regular education student; the tenth percentile of the estimated expenditures for special education students was greater than the mean for regular education students.

A comparison of the estimates for the six primary handicap groups, shows that the estimated mean per pupil expenditure was lowest for speech impaired children and highest for physically/multiply handicapped children (roughly double that for speech impaired children, on average). The variation across children in per pupil expenditures was the greatest for learning disabled students, who also showed the widest variation across children in functional status. Disability classification alone explained about 16% of the variation across children in total estimated per pupil expenditures.

The estimated 90th percentiles of total per pupil expenditures were as high as $17,000 for physically/multiply handicapped children; the maximums, not reported in Table 5-5 were considerably higher, to nearly $30,000. Figures such as these have alarmed the general public and have created a (false) impression that a small number of severely handicapped students are draining away the resources from the rest of the special education program.

Table 5-6 presents figures that belie this myth. The column on the left presents the distribution of *students* in the sample by primary handicap; the column on the right displays the distribution of *resources* by primary handicap. Although the proportion of aggregate resources devoted to hearing impaired and physically/multiply handicapped students exceed their prevalence in the sample by as much as 50%, their total combined share of the resources was still less than 6.5%. Only the

speech-impaired group received a smaller share of the aggregate resources than its size would suggest. However, this group was least impaired, on average, on every functional status measure (with the exception of speaking problems) and may have had less need for supplemental special instruction and services than students classified in any of the other groups.

Per Pupil Expenditure for Instruction and Related Services

Table 5-7 presents the estimated mean and standard deviation of per pupil expenditures for instruction and for related services, separately, by primary handicap within study site. Overall and in Milwaukee and Rochester, primary handicap accounted for two to three times more of the variation across primary handicaps in per pupil expenditures for related services than in per pupil expenditures for instruction.

Students classified as speech impaired received, on average, substantially fewer resources for instruction than students with other classifications (only $3232, as compared to $5686 to $6862), but substantially more resources for related services than average ($783 as compared to $608). The lower estimated mean per pupil expenditures for instruction for speech impaired students resulted from students receiving less individualized or small group academic instruction or having been placed in classrooms with larger class sizes.

Students classified as learning disabled or as hearing impaired had the largest variation across study sites in per pupil expenditure for instruction. This was due, in part, to the considerable variation

across study sites in placement for these groups, which will be explored in Section 6.

Students classified as learning disabled also had the lowest estimated mean per pupil expenditure for related services. In contrast, children classified as physically/multiply handicapped had the largest estimated mean per pupil expenditure for related services ($2803). The largest variations across study sites in per pupil expenditures for related services occurred among students classified as speech impaired or as hearing impaired.

The estimated mean per pupil expenditures by primary disability differed by school district. These differences may, in part, have been the result of the differing functional levels of the students described above but were largely the result of differing services provided students within each disability group.

Although the average total per pupil expenditure for instruction in Charlotte was lower than in Milwaukee or Rochester, within primary handicap groups, this remained true only for students classified as learning disabled and hearing impaired ($p < .01$). For students classified as speech impaired and emotionally disturbed, Charlotte had higher ($p > .10$) estimated mean per pupil expenditures for instruction than the other two districts. For the other two disability groups, no significant differences ($p > .10$) were found between Charlotte and the other two districts in estimated per pupil expenditures for instruction. Charlotte's significantly lower overall mean stems from a combination of the lower per pupil expenditure for instruction for learning disabled students and their high prevalence. Milwaukee and Rochester had similar per pupil expenditures for instruction for every primary handicap group

except one; students classified as learning disabled in Milwaukee had significantly higher ($p < .05$) estimated per pupil expenditures for instruction than those classified as learning disabled in Rochester.

Per pupil expenditures for related serviced differed considerably by study site. Overall, Charlotte had the highest per pupil expenditure for related services, $723 versus $628 in Milwaukee ($p < .01$) versus $416 in Rochester ($p < .01$). The mean per pupil expenditure for related services in Charlotte was also considerably higher ($p < .01$) than in the other two districts for students for all primary handicap groups except learning disabled and physically/multiply handicapped.

Per pupil expenditures for related serviced also differed considerably by primary handicap across study sites. The mean per pupil expenditure for related services for hearing impaired students in Charlotte was nearly $3000, more than three times as large as the mean in the other study sites. This was the result of a special program in Charlotte in which hearing impaired students were placed in regular settings with a sign interpreter (whose services were included in computing the per pupil expenditure for related services) assigned to their regular class. This also explains the lower than average per pupil expenditure for instruction for hearing impaired students in Charlotte; their counterparts in Milwaukee and Rochester were more often placed in a special class setting.

The estimated mean per pupil expenditure for related services in Rochester was the lowest ($p < .0001$) of the three for all classifications except physically/multiply handicapped. Of special note were the low mean per pupil expenditures for related services for emotionally disturbed and mentally retarded students.

Characteristics of Related Services by Primary Handicap

Table 5-8 presents a description of the related services received by children in the study by primary handicap group. The type and nature of related services provided differs considerably based on primary handicap and secondary conditions. The category "All Services" includes a summary of those listed in the table as well as several less prevalent services which are not listed separately (for example, sign interpreting). Students with all types of handicaps do appear to have received related health services in school.

Nearly 90% of the students classified as speech impaired received speech therapy, on average, for one and a half hours per week in a small group setting. Although a small percentage of the students classified as speech impaired received counseling, generally in a small group, they were not likely to receive other related services.

Students classified as learning disabled were the least likely to receive related services and this was reflected in the low estimated mean per pupil expenditure, $312. Those students who did receive related services typically received speech therapy or counseling, generally in a small group setting.

Only 19.4% of the students classified as emotionally disturbed received counseling in school. Those who did receive counseling were often treated individually and, on average, saw their counselor for a little over an hour a week. About one sixth of the students classified as emotionally disturbed also received speech therapy and about 8% received adaptive physical education.

Most students classified as mentally retarded received at least one related service. More than half received speech therapy, more than one quarter received adaptive physical education, and over 10% received each counseling and OT/PT. The range of services received by this group most closely resembled the range of services received by students classified as physically/multiply handicapped. This may have been the result of differing district practices with respect to the classification of mentally retarded and physically/multiply handicapped students.

Over three-quarters of the students classified as hearing impaired received speech therapy, on average for two hours per week. In addition, students in Charlotte who were classified as hearing impaired received sign interpreting in their regular classroom. Although this is not reflected separately in Table 5-8, it does account for the high estimated mean number of hours per week and per pupil expenditure for related services for this primary handicap group.

Students classified as physically/multiply handicapped received the largest number of related services of any of the primary handicap groups, an average of nearly three different services for each student. In addition, this group spent more time away from instruction receiving related services, four hours per week on average, than any other group. Nearly half of the students classified as physically/multiply handicapped received speech therapy (generally in an individual or small group setting), nearly 60% received adaptive physical education and over three-quarters received OT/PT.

Relationship between Primary Handicap and Per Pupil Expenditure for Instruction

Table 5-9 presents the results of two regression models for per pupil expenditure for instruction. In the first, Model I, only study site and primary handicap were included as predictors. In Model II, functional status was added as a predictor. Primary handicap was strongly related to per pupil expenditures for instruction. The explanatory power of the baseline model including only the three study site controls was increased from 0.2% to 11.6% with the addition of the primary handicap variables.

The addition of the seven functional status measures to the model increased the explanatory power of the predictors and the pooled F-test showed that as a group, the functional status measures were significantly related to resource levels for instruction. However, only one the functional status measures alone had a significant relationship with per pupil expenditure for instruction in this controlled model. Poorer academic standing was associated with higher per pupil expenditures for instruction.

These results confirm that functional status and primary handicap were neither independent of one another nor completely collinear in their relationships to estimated per pupil expenditures for instruction. The R2 for the regression model predicting estimated per pupil expenditures for instruction with functional status only (not presented here) was 9%, with primary handicap only was 12%, and with both together was 16%. Thus, most, but not all, of the explained variation was unique to each set of measures.

SECTION 6 -- PLACEMENT AND PER PUPIL EXPENDITURES[1]

P.L. 94-142 specifies that each child be placed in the "least restrictive environment" consistent with his needs and that handicapped children are to be "educated with children who are not handicapped, and that special classes, separate schooling, or other removal of handicapped children from the regular education environment occurs only when the nature or severity of the handicap is such that education in regular classes with the use of supplementary aids and services cannot be achieved satisfactorily." As a result of this requirement, the placements of many children have changed and, more importantly, the nature of the services provided to them have changed as well. Students who previously were educated in special schools or at home have been moved into special placements in regular schools, often with some interaction with students in regular classrooms. Many students who previously were educated in completely separate settings in regular schools now receive much of their instruction in regular settings.

In any analysis of special education expenditures, placement is an important variable to examine. Typically, special placements include much smaller classes (a mean of 8 students versus 28 students) and additional instructional personnel (usually aides). We would expect both of these factors to produce higher expenditures for more restrictive placements, and, in general, they do.

There was considerable variation across placements, even within primary handicap groups. Table 6-1 presents the estimated percent of

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[1] This section is substantially identical to material in a dissertation in progress by Ellen S. Raphael at Harvard University.

students and actual number of students in the sample assigned to each placement category, overall, by primary handicap, and by study site. Nearly 60% of the sample received some or all of their instruction in a regular classroom, with 27.7% placed in a regular classroom on a full-time basis. Less than 15% of the students based in a special classroom in a regular school actually received any instruction in a regular setting. Only 2.6% of the sample was placed in a separate special school setting. None of the students classified as speech impaired, learning disabled, or emotionally disturbed were placed in a special school.

Among students classified as speech impaired, four-fifths were placed in a regular class full-time and most of the remaining one-fifth were in a regular classroom for the majority of their academic instruction. This group had the narrowest range of placements of any of the primary handicap groups.

The base classroom (the classroom in which the child spent the majority of his or her time) for students classified as learning disabled was equally likely to be regular or special. However, nearly 90% of these students received some of their instruction in a special classroom, with 40% receiving all their instruction in a separate setting.

Over 70% of the students classified as emotionally disturbed were placed in a special classroom on a full-time basis. The other students classified as emotionally disturbed were spread among the other placement options in a regular school setting.

Nearly 15% of all students classified as mentally retarded were placed in a special school, however, these all were students from one

school district, Charlotte. The large majority of the other students with this classification received all their academic instruction in a special class placement.

Students classified as hearing impaired were placed in a variety of settings. Although the majority of them received all their academic instruction in a special classroom in a regular school, nearly one-third were placed in a regular class for at least a part of their academic day. These students were largely from Charlotte where hearing impaired students were mainstreamed with sign interpreting provided in the regular classroom.

The group that was most segregated academically were the students classified as physically/multiply handicapped. Less than one-sixth of these students received any academic instruction in a regular classroom, with two-thirds placed in a full-time special class in a regular school and the remaining one-sixth assigned to a special school.

The assignment of placement also varied across school district. In Charlotte, over three-quarters of the special needs students were based in a regular classroom for instruction. In fact, over one-third of the students in Charlotte received all of their instruction in a regular classroom. In contrast, in Rochester approximately one-third of all students received any instruction in a regular classroom, with nearly two-thirds of all students receiving all their instruction in a special setting. Milwaukee placed only 38% of its students in a regular classroom base but an additional 13% receive some academic instruction in a regular classroom, although they were based in a special classroom.

Rochester was the only sample which did not contain students in a special school placement; Rochester does have a special school but no

teacher interviews were conducted there. In Charlotte and Milwaukee, a very small percentage of the special education students was placed in a special school.

Table 6-2 presents the distribution of students by primary handicap and placement within study site. Although it is interesting to examine the distribution of students by primary handicap, placement, and study site simultaneously, the sample sizes were not large enough to present stable estimates for many of the cells in the table. Note that 62% of the cells have only 0 to 3 observations. Therefore, no three-way tables of estimated means are presented in this section. Regression models were used to control for all three factors simultaneously.

Table 6-3 presents the estimated means, standard deviations, 10th percentiles and 90th percentiles of total per pupil expenditure by placement. Students in special schools had an estimated mean total per pupil expenditure that was almost $2,300 higher ($p < .01$) than the estimated mean per pupil expenditure for students in regular schools. These placement differentials were related, at least in part, to functional status, however, because less-severely impaired students were placed in regular schools and thus may have been driving down the mean per pupil expenditure in regular schools.

The estimated mean total per pupil expenditure within a regular school increased as the placement became more restrictive, although the estimates for the two special classroom-based placements were not significantly different from one another ($p > .10$). Furthermore, the variability across students in total per pupil expenditure was greater for those students based in a special classroom than for those based in a regular classroom. These findings suggest that, on average, the least

restrictive placement is the least expensive. However, further analysis is required to have any confidence that this phenomenon persists after controlling for the underlying conditions of the students through primary handicap and functional status.

Functional status was associated with some of the variation in placement. Table 6-4 presents the estimated mean, standard deviation, and percent with a problem for each of the seven functional status measures, by placement. Each of the functional measures, except hearing ability, was significantly ($p < .0001$) related to classroom placement. Among students placed in a full-time regular class, nearly three-quarters exhibited a problem with speaking ability. In addition, the estimated mean number of domains affected for students placed in a full-time regular class was 2.68, suggesting that many of the students, even in a full-time regular placement, have difficulties in several areas of functioning.

The only significant ($p < .05$) difference in functional status between students placed in a full-time regular classroom and those who were placed in a regular classroom with pullout for some special instruction was in academic performance. On average, students based in a regular classroom who were receiving some of their instruction in special settings were more than one year further behind in school than their classmates who did not receive any special instruction.

No significant differences ($p > .05$) were found on any of the functional status measures between students based in special class settings in regular schools and their peers based in regular classrooms. In addition, no significant differences ($p > .10$) were found between

students in a full-time special placement and students based in a special class with pullout on any of the functional status measures.

There was a marked distinction in functional status between students in a regular school and students in a special school; the means of all the functional status measures except psychological well-being and hearing were significantly different ($p < .01$) between the two groups. Students in a special school setting were notably less able, on average, to care for their daily physical needs such as dressing, eating, toileting and less able to communicate basic information such as name, address, phone, time and money than their peers in regular schools. Furthermore, they exhibited functional problems in a multitude of domains -- greater than five, on average.

Having found a strong relationship between functional status and placement in the sample as a whole and noting the differences in distribution by placement among districts, we next examine whether, within a given placement, there were corresponding differences in the underlying functional status levels by study site. Table 6-5 presents mean functional status scores by study site within placement categories. For students based in a regular classroom for academic instruction, the only functional status measure which varied significantly by study site was academic ability -- students in Charlotte scored worse on that measure than students in the other two sites. In fact, the practice in Charlotte of placing so large a proportion of students in regular classes means that, on average, special needs students in Charlotte who received all their academic instruction in regular classes were behind grade academically, while their peers in Milwaukee and Rochester were, on average, ahead of grade.

Significant site differences also were found in the functional status of students placed in all special classes. These students in Rochester, on average, had somewhat better functioning in the domains of speaking ability, academic ability than in Milwaukee, who in turn had better functioning in these domains than students in Charlotte. Students in Milwaukee had better functioning in everyday knowledge than students in the other two sites. This suggests that the placement practices in Rochester were such that less functionally disabled students were being restricted to special classrooms than was the case in Milwaukee and in Charlotte.

The exception to this was for students who had hearing problems. In Rochester and Milwaukee, students in all special classes showed more dysfunction in hearing ability than their peers in Charlotte. This was largely due to the fact that hearing impaired students in Charlotte were placed in less restrictive settings (most often based in a regular classroom) than in Rochester and Milwaukee.

The estimated mean per pupil expenditures also varied by site within placement categories. Table 6-6 presents estimated mean per pupil expenditures for instruction and for related services by study site and placement. The estimated mean per pupil expenditure for instruction in Charlotte is not significantly different than in the other two sites overall. However, within a regular school, in each of the placements except a special class with pullout, the estimated mean per pupil expenditure for instruction in Charlotte was higher than in the other two districts. The large percentage of students placed in regular classrooms in Charlotte produced the low overall mean. Thus, although it appeared that resources devoted to children in Charlotte

lagged behind the those in the other two sites, in fact, within each placement option, children were receiving more attention; it was by means of using less restrictive placements that the district was reducing the mean per pupil expenditure for instruction. The estimated means for Rochester and Milwaukee were similar for all of the placements with the exception of special class with pullout where the estimated mean per pupil expenditure for instruction was considerably higher in Milwaukee than in Rochester. In each of the three districts, placement explained a substantial portion of the variation across children in per pupil expenditures for instruction.

In each of the placement categories, with the exception of regular class with pullout, Charlotte had higher per pupil expenditures for related services than the mean for all three study sites. For each group except those in a special class with pullout, Rochester had the lowest estimated mean of the three study sites.

Although there was considerable variation in estimated mean per pupil expenditure for related services within placement, overall and in Charlotte and Rochester, no consistent pattern emerged. This table does not present any evidence that per pupil expenditures for related services were systematically related to placement without controls for other factors.

In the regression models in Tables 6-7 and 7-4, the sample used includes only students placed in regular schools. Because there were only 38 students in special schools contained in the sample, 24 students in Charlotte classified as mentally retarded and 14 students in Milwaukee classified as hearing impaired or physically/multiply

handicapped, it was both too small and too limiting to be included as a separate category.

A model was estimated (not reported here) regressing total per pupil expenditure on study site, primary handicap, functional status, and placement. From the results of the regression, controlled means were calculated for total per pupil expenditure by placement. Students in an all regular placement had a controlled mean of $3,847, students in a regular placement with pullout for special instruction, $5,229, students in a special placement with some mainstreaming in a regular classroom, $8,649, and students in a full-time special class in a regular school, $8,695. Each of the estimates for total per pupil expenditure by classroom placement was significantly different from each of the others with the exception that the estimate for full-time special placement was not significantly different from the estimate for special placement with pullout.

Table 6-7 presents the results of a regression model predicting per pupil expenditures for instruction by study site, primary handicap, functional status and placement (Model III). The measures of placement were significantly related to expenditures, after controlling for study site, primary handicap and functional status, suggesting that the least restrictive environment was the least expensive one, with the per pupil expense increasing, on average, as the placement became more restrictive. In fact, the controlled differential between a full-time regular class and a full-time special class for per pupil expenditures for instruction was nearly $5,000. Furthermore, the introduction of placement as a predictor increased the explained variation from 16% to 29%. The magnitude of the coefficients of the primary handicap

variables dwindled such that only one, the coefficient on mentally retarded was significantly different from zero. The pooled test on the primary handicap variables also showed a substantial decrease in their significance as a group; they went from being highly significant ($p < .0001$) to being barely significant at the .05 level. In addition, the pooled F-test on the functional status measures as predictors changed from significant to not significant. These changes suggest that the effects of primary handicap and functional status represented in Model II were, in fact, largely effects of placement confounding the estimates when placement was left out of the model.

Therefore, no evidence was found that, after controlling for placement, the individual differences in children, as reflected in the functional status measures and the designation of primary handicap, were related to per pupil expenditures for instruction. Rather it appears that the assigned placement was most closely associated with levels of resources for instruction.

The lack of evidence of a relationship between per pupil expenditures for instruction and functional status may be the result of functional status measures which were not strong enough to pick up the true effect of functional status thereby leaving out of the model an important unobserved component of functional status and biasing the estimates for the placement and primary handicap variables. Because no bounds were placed on the possible magnitude of the bias, care must be taken in interpreting the results of this model and subsequent ones.

SECTION 7 -- BACKGROUND CHARACTERISTICS AND PER PUPIL EXPENDITURES[1]

There has been considerable concern within the special education community that resources have been allocated on a discriminatory basis; specifically, charges have been leveled that black students do not receive as high a level of services as white students (Heller, Holtzman & Messick, 1982). In order to examine this premise, per pupil expenditures were analyzed with respect to several child and family background characteristics available from the data: race, poverty/income ratio, mother's education, gender and parent attendance at the child's IEP conference.

Table 7-1 presents the estimated mean, standard deviation, 10th percentile and 90th percentile of total per pupil expenditure by background characteristics. The large standard deviations demonstrate that estimated total per pupil expenditure varied widely *within* each sociodemographic group. However, none of the estimated means within a given background characteristic were significantly different from each other ($p > .10$). In fact, looking down the table, the estimated means appear to be strikingly similar and the explained variation across background characteristic groups is strikingly small and insignificant. The uncontrolled evidence, therefore, does not reveal any bias in the distribution of total resources based on race, SES, gender or parent involvement.

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[1] This section is substantially identical to material in a dissertation in progress by Ellen S. Raphael at Harvard University.

Table 7-2 presents the estimated mean per pupil expenditures for instruction and for related services by background characteristics. Although there was little difference in the estimated mean total per pupil expenditures within background characteristic groupings, there does seem to be some small variation in the breakdown of total expenditure by component parts within background characteristic groupings. Because of the magnitude of the estimates for per pupil expenditures for instruction, these small variations produced no evidence of significant differences ($p > .10$) within any of the background characteristic groupings in estimated mean per pupil expenditures for instruction and explained variation in the expenditure estimates was very small.

Significant differences were found ($p < .05$) within each of the background characteristic groupings in estimated per pupil expenditures for related services; the estimated per pupil expenditure for related services was lower for blacks than whites, for lower income than for higher income, for children with less educated mothers than for children with more educated mothers, for boys than for girls, and for students whose parents did not attend the IEP than for students whose parents were present at the IEP. However, the amount of variation in per pupil expenditure for related services which was explained by each of the background characteristics, although significant, was less than two percent.

In order to explore this relationship further, we must first investigate the relationship between estimated per pupil expenditures for related services and the functional status measures. The resource levels for related services were significantly correlated with speaking

ability (r=.27, p <.0001), everyday knowledge (r=.24, p <.0001), hearing ability (r=.10, p <.05) and with activities of daily living (r=.34, p <.0001). To test whether the differences in resource levels within the background characteristic groupings persist after controlling for the potentially confounding effects of placement, study site and functional status, a regression model was estimated. However, because interactions exist between primary handicap and the other included variables, the model had to be estimated separately by primary handicap group. The only two groups with sufficient sample size to model were speech impaired and learning disabled. The results of predicting estimated per pupil expenditures for related services by study site, functional status, placement and background characteristics are presented in Table 7-3.

After controlling for study site, functional status and placement, no significant relationships were found between the background characteristics as a group and estimated per pupil expenditures for related services for either the group classified as speech impaired or as learning disabled. It is possible that the assignment of primary handicap and placement were related to background characteristics, however a full examination of this question is beyond the scope of this study. However, after the assignments of primary handicap and placement have been made, there was no evidence to suggest that the allocation of resources for related services were associated with child and family background.

To test whether background characteristics were associated with per pupil expenditures for instruction after controlling for school district, primary handicap, functional status, and placement, a

regression model was estimated (Model IV) the results of which are presented in Table 7-4. After adding the background characteristics to the previously specified model (Model III) including study site, primary handicap, functional status, and placement, none of the background characteristics alone, nor those measuring SES pooled as a group, were significantly related to per pupil expenditures for instruction. However, the size and significance of the primary handicap and functional status variables did change considerably suggesting that a relationship may exist between background characteristics and the assignment of primary handicap. Although it is possible there was a significant relationship between background characteristics and primary handicap, in the controlled model, there was no evidence that an association existed between background characteristics and per pupil expenditure for instruction.

SECTION 8 -- POLICY IMPLICATIONS

We found large variations in estimated per pupil expenditures across children in our sample. Even within study site, primary handicap and placement groups, the variation persisted. This unexplained variation in resource levels may be attributable to: (1) random error; (2) other factors not included in our models; or (3) individualization of services based on characteristics we were unable to measure. It is worth noting that this unexplained variation was not associated with the children's race, socioeconomic status, and gender; therefore we believe that this unexplained variation does not suggest systematic bias in the allocation of resources.

To explore further the possibility that the residual variation in resource levels results from individualization, additional studies should be conducted with the individual child as the unit of analysis. Using the "typical" child as a unit of analysis does not permit researchers to examine relationships between resource levels and individual characteristics. In addition, improved measures of functional status should be developed and incorporated into future studies so that the effects of structural factors (primary handicap classification and placement) may be better isolated from functional factors (functional status). Additional studies with the individual child as the unit of analysis would also permit further investigation into the effects of input prices versus resource levels as factors in estimates of per pupil expenditures across school districts. Comparing expenditure estimates derived from district pricing schemes and uniform

pricing schemes can help identify which components of expenditure vary most across school districts.

We found no relationship between per pupil expenditures for related services and placement; in other words, similar service levels were provided to students with comparable needs, regardless of where they were placed. Unfortunately, because related services needed differ by the child's primary handicap, and because even with the stratified sample our sample sizes for the low prevalence handicaps were small, we were unable to investigate fully this relationship. Future studies of larger groups of students with low prevalence handicaps are needed.

In addition, the data on transportation expenditures proved to be inadequate and was therefore left out of the model. We believe that these expenditures vary considerably by primary handicap, school placement, district size and the distance a child lives from school; therefore we recommend further investigation into this component of expenditure.

The primary factor explaining the variation in per pupil expenditures for instruction was placement. Therefore, where a child is placed determines, in large part, the services he will receive. Although it may be considered either a strength or a weakness that this effect exists, the regular education initiative currently under debate in the special education community threatens to dismantle this structural factor. Proponents of the initiative argue that all mildly handicapped students should be placed in regular classrooms on a full-time basis, and that the regular teacher should provide any requisite additional instruction. We found no evidence that regular classroom teachers allocate their time to special needs students on the basis of

the functional status, as captured by our measures, or primary handicap of the students.

Furthermore, we have found evidence that classification and placement differ among school districts and, therefore, where a child lives determines, in part, the level of resources provided to him. Additional research is needed to determine whether these differences are related to child and family background characteristics such as race, socioeconomic status or gender. Although we did not find any direct relationship between child and family background characteristics and resource levels, we can not rule out the possibility that there is bias in the district practices with respect to classification and/or placement.

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TABLE 3-1: Sociodemographic Characteristics of the Study Sites

Sociodemographic Characteristic	CHARLOTTE All	CHARLOTTE Spec Ed	MILWAUKEE All	MILWAUKEE Spec Ed	ROCHESTER All	ROCHESTER Spec Ed
Number enrolled						
Grade K-6	38,003	2,893	38,407	4,079	18,846	2,530
% students in Special Education	-	7.6%	-	10.6%	-	13.4%
Race/Ethnicity						
% white	56.9[a]	42.8[a]	38.1	38.7	36.9	38.2
% black	40.6	56.7	50.5	52.9	49.0	51.3
% hispanic	0.0	0.1	7.5	5.6	11.3	9.6
% other	2.0	0.4	3.8	2.8	2.5	0.9
Income						
% w/family income below 130% of poverty line	33	38	50	45	40[b]	52[b]
Gender						
% male		69		69		65

[a] Difference significant ($p<.001$)
[b] Difference significant ($p<.05$)

Note. From "Health and Special Education: A Study of New Developments for Handicapped Children in Five Metropolitan Communities" by J. S. Palfrey, J. D. Singer, D. K. Walker and J. A. Butler, 1986, *Public Health Reports*, *101*, p. 382. Adapted by permission.

TABLE 3-2: Model for Estimating Per Pupil Expenditures for Education

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$TOTAL\ EXPENDITURE_i = INSTRUCTION_i + RELATED\ SERVICES_i + INDIRECT_i$

where:

INSTRUCTION = TEACHER + AIDE + OTHINSTR

RELATED SERVICES = RELSERV

INDIRECT = GENADMIN + SPECEDAD + SUPPLIES + ASSESS + FOODSERV + MAINTEN

and:

TEACHER* = Cost of teacher services provided to $child_i$ for the teacher with whom $child_i$ spends most of his or her day

AIDE* = Cost of services provided by instructional aides to $child_i$ in his or her classroom

OTHINSTR* = Cost of instruction received by $child_i$ outside the classroom in which $child_i$ spends most of his or her day (includes specialized subjects such as math and language arts as well as music, shop, art and gym)

RELSERV* = Cost of related special education services $child_i$ receives in school from someone other than the teacher with whom he or she spends most of his or her day

GENADMIN# = Allocable portion of the costs of administrative services at the school and district levels

SPECEDAD# = Allocable portion of the costs of administering the special education program in which $child_i$ is enrolled

SUPPLIES# = Cost of textbooks, instructional supplies, and instructional equipment

ASSESS# = Cost of screening, assessment, admission and IEP conferences

FOODSERV** = Cost of breakfasts and lunches provided at school

MAINTEN** = Allocable portion of building maintenance and operations

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Sources of data:

* Individual child estimates derived from Collaborative Study data and district financial data

** Per pupil estimates derived from district budgets and enrollment figures

\# Per pupil estimates by primary handicap and placement derived from Rand Study and adjusted by economic indices

TABLE 4-1: Estimated Total Per Pupil Expenditures by Site Using <u>District</u> Pricing

Study Site	N	Estimated Mean	Estimated Std Dev	10^{th} %ile	90^{th} %ile
Overall	571	7,590	4,059	4,085	13,262
Charlotte	218	5,959	2,611	3,466	10,471
Milwaukee	202	8,539	4,894	4,810	14,954
Rochester	151	8,711	3,788	4,600	14,413

<u>Note</u>. R^2 = 10.1% ($p < .0001$)

Table 4-2: Average Teacher Salaries (Including Fringe Benefits) By Study Site, 1982-83

Study Site	Regular Ed	Special Ed	Fringe Benefit Rate
Charlotte	$24,290	$24,167	22.7%[a]
Milwaukee	34,477	28,730	33%
Rochester	34,844	30,063	33%
National average[b]	26,038	24,004	

[a] Pension fund is not fully-funded.
[b] Note. From National Center for Education Statistics; telephone conversation with author.

TABLE 4-3: Estimated Per Pupil Eexpenditures, Total and Component, by Study Site, Using District and Uniform Pricing

	Overall	Charlotte	Milwaukee	Rochester	R^2
District Pricing					
Total	7,590[a]	5,959	8,539	8,711	10.1***
	4,059[b]	2,611	4,894	3,788	
Instruction	5,174	3,757	5,908	6,266	8.8***
	3,790	2,298	4,691	3,556	
Related Services	589	591	616	549	0.1
	920	1,022	829	886	
Indirect	1,827	1,611	2,014	1,895	86.6***
	190	62	78	69	
Uniform Pricing					
Total	7,577	7,319	7,839	7,606	0.3
	3,774	3,190	4,605	3,286	
Instruction	5,190	4,839	5,431	5,381	0.6
	3,512	2,821	4,372	3,077	
Related Services	608	723	628	416	1.6**
	966	1,199	844	678	
Indirect	1,779	1,757	1,780	1,809	1.9**
	149	138	159	144	

[a] Estimated mean
[b] Estimated standard deviation

Table 5-1: Description of Primary Handicap Groups

Speech Impaired: a communication disorder such as stuttering, impaired articulation, a language impairment, or a voice impairment

Learning Disabled: a disorder in one or more of the basic psychological processes involved in the understanding or in using language, spoken or written, which may manifest itself in an imperfect ability to listen, think, speak, write, spell or do mathematical calculations; does not include children who have learning problems which are primarily the result of visual, hearing, or motor handicaps, of mental retardation, of emotional disturbance, or of environmental, cultural or economic disadvantage

Emotionally/Behaviorally Impaired: exhibiting one or more of the following characteristics over a long period of time and to a marked degree, which adversely affects educational performance: (a) an inability to learn which can not be explained by intellectual, sensory, or health factors; (b) an inability to build or maintain satisfactory personal relationships with peers and teachers; (c) inappropriate types of behavior or feelings under normal circumstances; (d) a general pervasive mood of unhappiness or depression; or (e) a tendency to develop physical symptoms or fears associated with personal or school problems

Mentally Retarded: significantly subaverage general intellectual functioning existing concurrently with deficits in adaptive behavior and manifested during the developmental period

Hearing Impaired/Deaf: a hearing impairment, whether permanent or fluctuating; or a hearing impairment which is so severe that the child is impaired in processing linguistic information through hearing, with or without amplification

Vision Impaired: a vision impairment which, even with correction, adversely affects a child's educational performance

Physically/Multiply Handicapped: a severe orthopedic impairment, including impairments caused by congenital abnormalities, disease or other causes; an autistic condition; having limited strength, vitality or alertness, due to chronic or acute health problems; or concomitant impairments the combination of which causes such severe educational problems that they cannot be accommodated in special education programs solely for one of the impairments

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Note. From Section 300.5 of the Regulations of EHA as reprinted in *P.L. 94-142: Impact on the Schools* by R. Weiner, 1985, Arlington, VA: Capitol Publications, pp. 179-80.

TABLE 5-2: Distribution of Special Education Students by Primary Handicap and Study Site

Primary Handicap	Charlotte	Milwaukee	Rochester	All Sites	National[a]
Speech	32.8[b] (32)[c]	35.9 (36)	30.6 (21)	33.5 (89)	26.6
Learning	44.5 (65)	31.2 (37)	33.4 (43)	35.8 (145)	40.9
Emotional	5.6 (32)	15.7 (39)	14.0 (19)	12.2 (90)	8.3
Mental	14.9 (63)	11.0 (28)	15.9 (36)	13.5 (127)	17.8
Vision	0.5 (4)	0.8 (7)	0.1 (1)	0.5 (12)	0.7
Hearing	0.9 (11)	2.0 (22)	2.6 (18)	1.8 (51)	1.7
Phys/Mult	0.9 (11)	3.4 (33)	3.5 (13)	2.7 (57)	4.0
Total	100.0 (218)	100.0 (202)	100.0 (151)	100.0 (571)	100.0

[a] Note. From *Seventh Annual Report to Congress on the Implementation of The Education of the Handicapped Act* by the U. S. Department of Education, 1985, adapted from Table 2, p.2. Figures reflect the 1982-32 school year.

[b] Note. From "Variation in Special Education Across School Districts: How Does Where You Live Affect What You Are Labeled?" by J. D. Singer, J. S. Palfrey, J. A. Butler, and D. K. Walker, 1988, submitted for publication, p. 37.

[c] Number of actual students in sample

TABLE 5-3: Functional Status by Primary Handicap

Functional Measure	Speech	Learning	Emotional	Mental	Hearing	Phys/ Mult	R^2
Speaking ability	0.95[a]	0.35	0.49	1.02	1.21	1.24	17.0***
	0.84[b]	0.82	0.66	0.72	0.38	0.44	
	76.6[c]	26.2	31.3	63.2	78.0	66.8	
Academic level	0.21	1.39	1.47	2.65	0.48	1.82	22.7***
	1.66	1.72	1.35	1.37	0.80	0.87	
	36.1	82.5	74.6	92.0	47.31	74.1	
Social skills	-0.08	0.08	1.56	0.07	-0.40	-0.67	16.7***
	2.06	1.85	1.39	1.08	0.78	0.48	
	58.8	61.2	92.5	69.9	36.1	36.4	
Psych well-being	-0.82	0.13	1.89	0.08	-0.16	0.08	10.6***
	2.69	3.21	1.92	1.68	1.25	1.25	
	44.2	57.8	89.2	64.4	50.7	59.3	
Everyday knowledge	0.53	0.35	0.71	1.92	0.90	1.88	19.0***
	1.34	1.00	1.18	1.51	0.78	0.94	
	25.0	19.9	28.7	67.1	31.0	64.3	
Hearing	0.18	0.12	0.06	0.18	1.89	0.20	65.2***
	0.54	0.45	0.20	0.36	0.15	0.26	
	16.2	11.7	5.9	15.4	100.0	13.0	
Activ of daily liv	-0.80	-0.82	-0.71	-0.25	-0.62	2.65	45.2***
	0.51	0.50	0.65	1.06	0.58	1.09	
	31.9	30.8	36.7	54.3	26.1	98.2	
Number of domains	2.89	2.90	3.59	4.26	3.69	4.12	
	1.86	1.79	1.05	1.15	0.84	0.69	

[a] Estimated mean
[b] Estimated standard deviation
[c] Estimated percent with problem

TABLE 5-4: Estimated Mean Functional Status Levels by Site within Primary Handicap Group

Primary Handicap and Functional Status Measure		Study Site			
		Charlotte	Milwaukee	Rochester	R^2
SP	Speaking	.90	.97	1.00	4.3
	Academics	.40	.34	-.33	5.8~
	Social Skills	-.12	-.08	-.02	>0.1
	Psychological	-.88	-.82	-.73	0.1
	Everday Knowldege	.66	.63	.14	4.6
	Hearing	.14	.25	.10	2.6
	Activ of daily living	-.76	-.79	-.90	2.1
LD	Speaking	.31	.33	.42	0.6
	Academics	1.51	1.47	1.15	1.5
	Social Skills	-.10	.10	.32	1.6
	Psychological	-.08	-.06	.60	1.6
	Every Knowldege	.23	.53	.35	2.3
	Hearing	.12	.07	.19	1.7
	Activ of daily living	-.89	-.62	-.88	9.1**
ED	Speaking	.77	.41	.37	5.1
	Academics	1.94	1.40	1.13	4.1
	Social Skills	1.24	1.74	1.57	1.8
	Psychological	1.63	2.03	1.90	0.1
	Every Knowldege	.97	.74	.42	2.0
	Hearing	.06	.06	.05	>0.1
	Activ of daily living	-.60	-.64	-.93	2.8
MR	Speaking	1.20	1.33	.69	9.2**
	Academics	2.98	2.81	2.29	3.4
	Social Skills	-.20	.16	.24	2.6
	Psychological	.16	-.14	.14	>0.1
	Every Knowldege	2.65	2.33	1.09	14.2***
	Hearing	.14	.24	.17	0.7
	Activ of daily living	.17	-.35	-.53	5.1~
HR	Speaking	1.27	1.60	.89	17.4**
	Academics	1.18	1.32	-.47	27.4***
	Social Skills	-1.01	.19	-.58	9.1
	Psychological	-1.34	.46	-.11	7.3
	Every Knowldege	.27	2.00	.33	24.2**
	Hearing	1.82	1.85	1.94	2.6
	Activ of daily living	-.74	-.06	-.98	10.6~
PM	Speaking	.90	1.32	1.31	3.2
	Academics	1.85	2.00	1.54	1.2
	Social Skills	-.89	-.49	-.82	3.3
	Psychological	-.60	.95	-.84	10.2~
	Every Knowldege	.60	2.79	1.23	21.4**
	Hearing	.30	.04	.38	9.5~
	Activ of daily living	1.56	3.47	2.02	12.6*

TABLE 5-5: Estimated Total Per Pupil Expenditures By Primary Handicap Using Uniform Pricing

Primary Handicap	N	Estimated Mean	Estimated Std Dev	10th %ile	90th %ile
Overall	571	7,577	3,774	4,226	12,857
Speech	89	5,565	3,247	3,111	9,687
Learning	145	7,843	5,242	4,217	11,327
Emotional	90	9,144	3,599	4,855	14,164
Mental	127	8,368	2,368	5,275	11,805
Hearing	51	9,960	1,541	6,701	14,250
Phys/Mult	57	11,097	1,773	5,790	17,037
Regular Ed		4,155[a]			

[a] Computed by using speech impaired children in all regular placements (see text for details).

Note. R^2 = 16.4% ($p < .0001$)

TABLE 5-6: Comparison of Distribution of Children by Primary Handicap with Distribution of Resources by Primary Handicap

Primary Handicap	Distribution of Children		Distribution of Resources	
Speech	33.5%		25.1%	
Learning	35.8%		37.8%	
Emotional	12.2%		15.0%	
Mental	13.5%		15.2%	
Vision	0.5%		0.5%	
Hearing	1.8%	5.0%	2.4%	6.9%
Phys/Mult	2.7%		4.0%	

TABLE 5-7: Estimated Mean Per Pupil Expenditures for Instruction and Related Services by Study Site and Primary Handicap

Type of Expenditure and Primary Handicap	Overall	Charlotte	Milwaukee	Rochester	R^2
Instruction $					
All	5,190	4,839	5,431	5,381	0.2
Speech	3,232	3,896	2,665	3,246	6.3~
Learning	5,697	4,484	7,611	5,812	11.1***
Emotional	6,676	7,897	6,191	6,419	3.5
Mental	5,686	6,084	5,190	5,645	1.7
Hearing	6,862	4,618	7,461	7,335	14.6*
Phys/Mult	6,526	6,541	6,442	6,664	>0.1
R^2	11.0***	16.5***	18.1***	14.1**	
Related Services $					
All	608	723	628	416	1.5*
Speech	783	1,114	660	457	10.0**
Learning	312	316	350	266	0.3
Emotional	528	890	514	197	7.8*
Mental	788	1,109	780	463	6.2*
Hearing	1,206	2,987	794	777	18.2**
Phys/Mult	2,803	2,464	2,994	2,673	1.0
R^2	24.6***	17.7***	40.2***	45.8***	

TABLE 5-8: Characteristics of Related Services Received by Primary Handicap

Related Service	Speech	Learning	Emotional	Mental	Hearing	Phys/Mult
Speech Therapy						
% Receiving	89.7	19.1	16.8	57.7	77.9	47.1
Hrs/week	1.5[a]	1.6	1.7	1.5	2.0	1.8
Group size	3.1[a]	3.3	2.5	3.2	3.1	1.9
Counseling						
% Receiving	9.2	12.7	19.4	10.3	6.9	20.0
Hrs/week	1.3	1.1	1.2	1.2	1.0	1.2
Group size	3.9	3.2	1.6	2.9	5.9	3.7
OT/PT						
% Receiving	0.0	0.7	1.3	12.9	5.0	76.9
Hrs/week	-	1.0	1.0	1.8	1.7	2.0
Group size	-	1.0	1.0	3.3	1.5	1.5
Adaptive PE						
% Receiving	1.1	0.7	7.9	25.7	8.5	59.9
Hrs/week	1.0	1.0	1.2	1.2	2.0	1.1
Group size	7.5	7.5	6.1	6.8	5.9	7.4
ALL SERVICES						
No of serv	1.0[a]	0.4	0.5	1.1	1.2	2.9
Hrs/week	1.5[a]	0.6	0.6	1.6	3.1	4.0
Total $	783[a]	312	528	788	1,206	2,803

[a] Estimated mean

TABLE 5-9: Predicting Per Pupil Expenditure For Instruction Using Study Site and Primary Handicap (Model I) and Study Site, Primary Handicap, and Functional Status (Model II)

Predictor	Model I Coeff	Model I SE	Model II Coeff	Model II SE
Study Site				
Charlotte	3,076***	425	2,650***	502
Milwaukee	3,289***	422	2,842***	496
Rochester	3,162***	446	2,965***	514
pooled F-test[a]	$p < .0001$		$p < .0001$	
pooled F-test[b]	$p < .0001$		$p = .0560$	
Primary Handicap				
Learning	2,629***	522	2,257***	509
Emotional	3,676***	522	2,963***	566
Mental	2,816***	500	1,812**	577
Hearing	3,607***	609	3,561***	905
Phys/Mult	3,108***	603	2,899***	776
pooled F-test	$p < .0001$		$p < .0001$	
Functional Status				
Speaking			285	214
Academics			312**	101
Social Skills			-20	152
Psychological			161~	95
Everyday Skills			94	122
Hearing			-185	395
Acts of Daily Living			-197	147
pooled F-test			$p < .01$	
Model R^2	11.6***		15.7***	

[a] Tests if coefficients are significantly different from zero.
[b] Tests if coefficients are significantly different from each other.

Sample: N=496; vision impaired students and students with function status scores missing excluded.

TABLE 6-1: Distribution of Special Education Students by Placement within Primary Handicap and Study Site

	All	Regular School				Special School
		All Regular	Reg w/ pullout	Spec w/ pullout	All Spec	
Overall	93.3[a] (533)[b]	27.7 (110)	23.8 (108)	6.2 (36)	39.7 (279)	2.6 (38)
Primary Handicap						
Speech	100.0 (89)	80.3 (72)	16.6 (14)	--	3.2 (3)	--
Learning	100.0 (145)	11.9 (17)	38.8 (56)	8.6 (12)	40.7 (60)	--
Emotional	100.0 (90)	5.0 (5)	9.8 (10)	13.6 (11)	71.6 (64)	--
Mental	85.8 (103)	1.8 (2)	8.7 (14)	4.4 (5)	71.6 (82)	14.2 (24)
Hearing	93.3 (47)	13.6 (7)	11.9 (7)	5.9 (3)	61.9 (30)	6.7 (4)
Phys/Mult	84.2 (47)	8.7 (5)	3.3 (2)	3.9 (2)	68.3 (38)	15.8 (10)
Study Site						
Charlotte	94.5 (194)	35.5 (56)	41.1 (73)	2.2 (6)	15.7 (59)	5.5 (24)
Milwaukee	98.6 (188)	23.3 (28)	14.6 (23)	13.0 (25)	47.7 (112)	1.4 (14)
Rochester	100.0 (151)	22.0 (26)	11.0 (12)	2.9 (5)	64.2 (108)	--

[a] Estimated percent in placement
[b] Number of actual students in sample

TABLE 6-2: Sample Sizes by Study Site, Primary Handicap and Placement

Primary Handicap	Placement	Charlotte	Milwaukee	Rochester
Speech	All Regular	29	24	19
	Reg w/pullout	3	11	0
	Spec w/pullout	0	0	0
	All Special	0	1	2
Learning	All Regular	14	1	2
	Reg w/pullout	43	3	10
	Spec w/pullout	2	8	2
	All Special	6	25	29
Emotional	All Regular	3	1	1
	Reg w/pullout	6	3	1
	Spec w/pullout	1	9	1
	All Special	22	26	16
Mental	All Regular	2	0	0
	Reg w/pullout	13	0	1
	Spec w/pullout	1	4	0
	All Special	23	24	35
	Special School	24	0	-
Hearing	All Regular	5	0	2
	Reg w/pullout	3	4	0
	Spec w/pullout	2	0	1
	All Special	1	14	15
	Special School	0	4	-
Phys/Mult	All Regular	2	2	1
	Reg w/pullout	2	0	0
	Spec w/pullout	0	1	1
	All Special	7	20	11
	Special School	0	10	-

TABLE 6-3: Estimated Total Per Pupil Expenditures by Placement

Placement	N	Estimated Mean	Estimated Std Dev	10th %ile	90th %ile
Overall	571	7,577	3,774	4,226	12,857
Regular School	533	7,518	3,840	4,163	12,802
All Regular	110	5,368	2,860	3,091	9,581
Reg w/pullout	108	6,329	2,596	4,125	10,542
Spec w/pllout	36	10,074	5,734	5,704	15,265
All Special	279	9,331	3,394	5,718	14,250
Special School	38	9,789	2,319	6,028	16,102

Note. R^2 = 23.1% ($p < .0001$)

TABLE 6-4: Functional Status by Classroom and School Placement

Functional Status Measure	Regular School: All Regular	Reg w/ pullout	Spec w/ pullout	All Special	Special School	R^2
Speaking ability	0.88[a]	0.32	0.35	0.71	1.74	12.6***
	0.77[b]	0.69	0.68	0.76	0.37	
	72.3[c]	24.6	25.8	46.0	92.2	
Academic level	0.19	1.27	1.65	1.77	2.90	15.9***
	1.55	1.66	1.31	1.41	1.37	
	34.1	79.5	87.5	83.0	82.8	
Social skills	-0.12	-0.30	0.11	0.67	-0.06	4.6***
	1.88	1.48	1.47	1.46	0.70	
	55.4	52.7	68.8	75.8	69.8	
Psych well-being	-0.94	-0.36	0.04	0.89	1.29	9.7***
	2.44	2.80	1.66	2.18	1.58	
	42.4	45.5	62.8	75.0	73.3	
Everyday knowledge	0.37	0.35	0.33	0.99	4.35	33.7***
	1.09	0.95	0.85	1.30	0.61	
	17.7	17.7	20.4	43.2	98.3	
Hearing	0.13	0.21	0.24	0.18	0.28	0.5
	0.44	0.54	0.66	0.43	0.32	
	12.3	18.4	12.8	14.4	24.1	
Activ of daily liv	-0.78	-0.88	-0.77	-0.53	1.98	23.0***
	0.56	0.30	0.44	0.92	1.59	
	34.2	23.8	40.7	42.2	82.8	
Number of domains	2.68	2.62	3.19	3.80	5.23	
	1.67	1.41	1.18	1.28	0.73	

[a] Estimated mean
[b] Estimated standard deviation
[c] Estimated percent with problem

TABLE 6-5: Estimated Mean Functional Status Levels by Study Site within Placement

Placement	Functional Status Measure	Study Site			R^2
		Char	Milw	Roch	
All Regular	Speaking	.78	.97	.95	0.1
	Academics	.72	-.17	-.41	16.4***
	Social skills	-.17	.08	-.28	0.2
	Psychological	-.82	-.83	-1.32	0.9
	Everday knowledge	.45	.46	.09	1.2
	Hearing	.16	.09	.13	0.9
	Activ of daily living	-.79	-.71	-.87	0.1
	No. of Domains	3.02	2.50	2.12	--
Reg w/ pullout	Speaking	.26	.58	.18	0.3
	Academics	1.44	1.09	.79	6.1**
	Social skills	-.22	-.42	-.44	>0.1
	Psychological	-.23	-.91	-.05	>0.1
	Everyday knowledge	.34	.56	.09	0.6
	Hearing	.15	.47	.09	0.8
	Activ of daily living	-.86	-.88	-.96	1.2
	No. of Domains	2.74	2.90	2.17	--
Spec w/ pullout	Speaking	.33	.27	.73	0.1
	Academics	1.49	1.92	.71	0.9
	Social skills	.00	-.01	.70	>0.1
	Psychological	-.17	-.19	1.26	>0.1
	Everyday knowledge	.44	.28	.40	5.8
	Hearing	.27	.09	.81	2.0
	Activ of daily living	-.96	-.74	-.72	5.2
	No. of Domains	4.17	3.07	3.80	--
All Special	Speaking	.98	.74	.59	1.8*
	Academics	2.34	1.78	1.56	5.1***
	Social skills	.71	.72	.62	>0.1
	Psychological	1.04	.83	.88	>0.1
	Everyday knowledge	1.22	1.25	.69	1.8*
	Hearing	.06	.16	.24	1.9*
	Activ of daily living	-.52	-.36	-.68	0.5
	No. of Domains	4.18	4.24	3.64	--
Special School	Speaking	1.78	1.62	--	--
	Academics	3.33	1.38	--	--
	Social skills	-.09	.04	--	--
	Psychological	1.21	1.58	--	--
	Everyday knowledge	4.39	4.23	--	--
	Hearing	.22	.46	--	--
	Activ of daily living	1.53	3.51	--	--
	No. of Domains	5.28	5.08	--	--

TABLE 6-6: Estimated Means of Components of Per Pupil Expenditures by Study Site and Placement

Type of Expenditure and Placement	Overall	Charlotte	Milwaukee	Rochester	R^2
Instruction $					
All	5,190	4,839	5,431	5,381	0.2
Regular School	5,175	4,805	5,408	5,381	0.1
All Regular	3,032	3,597	2,288	2,745	8.6**
Reg w/pullout	4,198	4,558	3,725	3,064	6.0*
Spec w/pullout	7,431	5,726	8,020	5,854	0.4
All Special	6,902	8,048	6,736	6,657	3.2*
Special School	5,751	5,442	7,077	-	5.9
R^2	22.0***	30.5***	18.0***	30.1***	
Related Services $					
All	608	723	628	416	1.5*
Regular School	566	647	595	416	0.8
All Regular	761	1,015	564	440	9.5**
Reg w/pullout	337	305	629	0	1.3
Spec w/pullout	754	895	666	1,113	6.5
All Special	537	674	579	446	1.3
Special School	2,200	2,026	2,946	-	5.9
R^2	9.3***	9.7***	16.0***	5.9*	

TABLE 6-7: Predicting Per Pupil Expenditure For Instruction Using Study Site, Primary Handicap, and Functional Status (Model II) and Study Site, Primary Handicap, Functional Status and Placement (Model III)

Predictor	Model II Coeff	Model II SE	Model III Coeff	Model III SE
Study Site				
Charlotte	2,499***	530	3,125***	509
Milwaukee	2,611***	517	2,023***	497
Rochester	2,783***	536	1,982***	509
pooled F-test[a]	$p < .0001$		$p < .0001$	
pooled F-test[b]	$p = .1501$		$p < .0001$	
Primary Handicap				
Learning	2,234***	515	-256	587
Emotional	3,007***	573	-166	655
Mental	1,865**	595	-1,396*	676
Hearing	2,994**	946	325	923
Phys/Mult	3,431***	890	625	888
pooled F-test	$p < .0001$		$p = .05$	
Functional Status				
Speaking	301	221	91	206
Academics	358**	110	193~	103
Social Skills	-29	158	-85	147
Psychological	138	102	59	95
Everyday Skills	120	134	-19	124
Hearing	-62	411	-113	383
Acts of Daily Living	-335~	194	-400*	179
pooled F-test	$p < .01$		$p = .23$	
Placement				
Regular with pullout			1,337*	553
Special with pullout			4,256***	812
All Special			4,762***	585
pooled F-test			$p < .0001$	
Model R^2	16.0***		29.2***	

[a] Tests if coefficients are significantly different from zero.
[b] Tests if coefficients are significantly different from each other.

Sample: N=465; vision impaired students, students in special schools and students with function status scores missing excluded.

TABLE 7-1: Estimated Total Per Pupil Expenditures by Child and Family Background Characteristics

Background Characteristic	N	Estimated Mean	Estimated Std Dev	10th %ile	90th %ile
Race					
White	232	7,397	3,616	4,104	13,206
Black	307	7,458	3,485	4,276	12,486
R^2		0.2			
Poverty Status					
Poor	114	7,659	3,674	4,324	12,278
Near Poor	94	7,880	4,426	4,083	14,089
Low Income	81	7,091	3,432	3,827	12,566
Mid to High Inc	142	7,055	3,056	4,123	13,134
R^2		>0.1			
Mother's Education					
Prim Sch Only	37	7,202	2,810	4,117	10,866
Some High Sch	132	7,656	3,863	4,118	12,837
High Sch Grad	175	7,447	3,802	4,087	12,579
Some College	71	7,205	3,281	4,318	15,628
College Grad	32	6,700	2,602	4,123	11,458
R^2		0.4			
Gender					
Male	329	7,409	3,984	4,119	12,859
Female	200	7,539	2,690	4,282	12,614
R^2		>0.1			
Parent Present at most recent IEP					
Parent present	206	7,194	3,233	4,219	13,326
Parent absent	253	7,594	3,725	4,183	12,427
R^2		>0.1			

Note. Includes only black and white students.

TABLE 7-2: Estimated Means of Components of Per Pupil Expenditures by Child and Family Background Characteristics

Background Characteristic	N	Expenditures for Instruction	Expenditures for Related Services
Race			
White	232	4,907	732
Black	307	5,132	535
R^2		>0.1	1.9**
Poverty Status			
Poor	114	5,360	497
Near Poor	94	5,478	647
Low Income	81	4,783	533
Mid to High Inc	142	4,516	781
R^2		>0.1	0.6~
Mother's Education			
Prim Sch Only	37	4,964	408
Some High Sch	132	5,339	536
High Sch Grad	175	5,055	628
Some College	71	4,682	753
College Grad	32	3,947	1,067
R^2		0.1	0.6~
Gender			
Male	329	5,063	573
Female	200	5,050	708
R^2		>0.1	1.2**
Parent Present at most recent IEP			
Parent present	206	4,704	724
Parent absent	253	5,223	589
R^2		2.8	1.2**

Note. Includes only black and white students.

TABLE 7-3: Predicting Expenditures for Related Services Using Study Site, Placement, Functional Status and Child and Family Background Characteristics by Primary Handicap

Predictor	Speech Impaired Coeff	SE	Learning Disabled Coeff	SE
Study Site				
Charlotte	282	1,037	401	643
Milwaukee	-86	1,022	255	658
Rochester	9	954	178	620
pooled F-test[a]	n.s.		n.s.	
pooled F-test[b]	n.s.		n.s.	
Functional Status				
Speaking	-74	247	212	132
Academics	153	135	-53	60
Social Skills	44	125	-35	89
Psychological	-3	105	52	56
Everyday skills	218	150	121	101
Hearing	-200	340	-22	263
Acts of Daily Liv	-604	402	-141	273
pooled F-test	n.s.		n.s.	
Placement				
Reg w/ pullout	-123	403	-316	274
Spec w/ pullout	--	--	197	414
All Special	-1,233	708	-160	342
pooled F-test	n.s.		n.s.	
Background Char				
Black	-155	327	74	181
Poverty Income Ratio	328*	148	-66	80
Mother's Education	-49	68	13	41
pooled F-test	n.s.		n.s.	
Male	197	308	24	186
Parent present at IEP	508	308	-91	160
Model R^2	29.5		16.8	
N	61		87	

[a] Tests if coefficients are significantly different from zero.
[b] Tests if coefficients are significantly different from each other.

Note. Sample includes only black and white students in regular schools.

TABLE 7-4: Predicting Expenditures for Instruction Using Study Site, Primary Handicap, Placement and Functional Status (Model III) and Using Study Site, Primary Handicap, Placement, Functional Status, and Child Background Characteristics (Model IV)

Predictor	Model III Coeff	Model III SE	Model IV Coeff	Model IV SE
Study Site				
Charlotte	3,174***	491	3,563**	1,142
Milwaukee	1,827***	485	2,209*	1,089
Rochester	2,158***	498	2,014*	1,035
pooled F-test[a]	p < .0001		p < .0001	
pooled F-test[b]	p < .0001		p < .002	
Primary Handicap				
Learning	-330	568	161	624
Emotional	191	629	193	685
Mental	-1,053	653	-187	743
Hearing	528	909	485	995
Phys/Mult	527	861	1,217	899
pooled F-test	p = .111		p = .675	
Placement				
Reg w/pullout	1,402**	529	1,651**	575
Spec w/pullout	3,674***	789	3,997***	872
All Special	4,507***	561	4,490***	645
pooled F-test	p < .0001		p < .0001	
Functional Status				
Speaking	117	204	409~	234
Academics	103	100	-20	116
Social Skills	-18	141	4	156
Psychological	48	92	91	105
Everyday skills	46	124	58	138
Hearing	-172	379	-176	414
Activ of Daily Living	-360*	182	-441*	193
pooled F-test	p = .548		p = .222	
Background Char				
Black			-307	345
Poverty Income Ratio			-216	154
Mother's Education			4	83
pooled F-test			p = .255	
Male			-92	345
Parent present at IEP			-586	328
Model R^2	30.1***		33.6***	

[a] Tests if coefficients are significantly different from zero.
[b] Tests if coefficients are significantly different from each other.
Sample: N=322; vision impaired students, students in special schools, students with missing scores on functional status measures and students who were neither black nor white excluded.